RAILROAD GAZETTE

FRIDAY, MAY 25.

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Contributions.

Locomotive Side Rods.

PHILADELPHIA, May 8, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of Sept. 16 last, Prof. J. B. Johnson explained the action of centrifugal force in the side rod of a locomotive, and noticed a certain Baldwin engine as an instance of the use of dimensions insufficient to provide for it.

In behalf of the home establishment, by which all Philadelphians rejoice to swear, I would merely say that the rod in question was not designed by them for high speeds. Baldwin engines with rods of plain section, $1\frac{5}{8} \times 5\frac{1}{2}$, as shown in the 1885 Report of the Master Mechanics' Association, p. 125, have been running constantly for seven years on fast passenger engines on the New Jersey Central at speeds frequently exceeding 70 and 80 miles per hour for short distances, and none of the rods have broken or shown any signs of doing so. The extreme fibre strains "f" in these rods, by Professor Johnson's formulæ are, roughly, at 70 miles per hour, 12,500 lbs. per square inch; at 80 miles per hour, 16,300 lbs. per square inch; the latter being about up to the limit under which wrought iron may safely be subjected to an indefinite number of stresses in opposite directions.

I would ask, however, whether f, as thus given by the formulæ, is not really the *modulus of rupture* instead of the *fibre strain;* or, in other words, whether Prof. Johnson has not treated the rod as a bundle of *loose* fibres, each acting with its own longitudinal strength merely, instead of as a comparatively homogeneous mass, in which each fibre receives very material assistance from its intimate connection with the less-strained fibres next to it, on the side nearest the centre of the bar. May not this circumstance explain the fact that so many bars (while they may be dangerously weak) at least "decline to break by the formula" and appear to hold their own "by force of habit?"

Other things being equal, the I section, advocated by Prof. Johnson, would certainly seem to be preferable to the rectangular, not only because it is better adapted to resist vertical transverse stresses, but also on account of the lateral stability given to the rod as a *pillar* by the width of the flanges.

The rods mentioned look thin, and (as I calculate them) have not a superabundant factor of safety as a pillar. Yet they appear to perform that duty perfectly.

The ideal rod is probably that having an I section and made deeper in the middle than at the ends. I enclose herewith blue-prints of two Baldwin rods made in this way.

JOHN C. TRAUTWINE, JR.

Danger from Compressed Gas.

TYRONE, Pa., May 9, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In an editorial of May 4 you refer to the fact that it has often been urged that compressed gas is not a safe material for lighting railroad cars. This is a most important subject, but, unfortunately, it has not received the attention and scientific investigation due to a matter of such great interest to the public. The dangerous car stove has been a prolific theme of thought and discussion for many years, but the damage arising from the use of gas and other inflammable materials for lighting cars has been rarely, or too infrequently, discussed in the public press.

As at present constructed, the gas-tank is attached under the car and charged with gas at a pressure of 200 pounds the square inch. The connecting pipes extend to a regulator in the saloon, and thence along the dome, supplying the various gas jets in the car. The pressure is so great in every part of the apparatus to the regulator that the attendant operating the gas fixtures is obliged to use a wrench in turning or moving the regulating cocks or valves.

Now, as to probable or even possible results in case of collision or derailment of a train, when the cars either telescope or roll down an embankment, shattered and broken, gas from the ruptured pipes instantly ignites, the immense pressure forcing the flames through débris or into sleepers and parlor cars, where the inflammable material must, of necessity, take fire and swell into a volume of flame and smoke. But, even if there should be no ignition, it is a well-known fact that there would be danger of almost instant suffocation from the immense volume of asphyxiating gas filling the interior of the cars.

It may be admitted that in case of a breakage of a pipe outside the car the gas would expend its force and power in the air, and coming in contact with wood only, there could be no fire from that cause, or even any other material damage; but I hold that if only one-fourth of the amount of gas were to ignite inside of a car, the upholstery and other combustible material would take fire at once and endanger the lives of passengers. It is a matter of official record that all, or nearly all, fatal railroad disasters—those in which fire has played an important part—have occurred at night, when the lamps or jets were lit, thus indicating that most of the railroad fatalities are undoubtedly due to the imperfect gas-lighting apparatus in connection with the heating arrangements.

J. W. T.

[Comment on this letter will be found in the editorial columns.—EDITOR RAILROAD GAZETTE]

The Martin Coupling for Steam Heating.

Beech Creek Railroad Company,
JERSEY SHORE, Pa., May 22, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I inclose you a little statement of one winter's experience with the Martin heater and coupling. If you feel disposed to insert this in your paper for the benefit of parties that have not used any heater you can do so.

We equipped one of our passenger trains last fall with this system and started with the cold weather. This train has run 180 miles every week-day up to the present time. There have been two failures of engine. First, by running into rear end of freight train. Second, by running into rock on track. In both cases damage was slight. Engine was disabled, so that another engine had to take the train to destination. The cars on both occasions kept warm until end of trip, which consumed about one hour and a half from time of accident.

Our road is very crooked; curves average from 6° to 14°. The ball joints and couplings have given us no trouble from leaking. They have been carefully looked after at a very light expense.

With our experience of one winter with metallic connections, we would dislike very much to change for a hose. The couplers were started in October, and at this time the wear shows very slight.

L. AMES,
Master Mechanic, Beech Creek R. R.

Distant Signals.

NEW YORK, May 21, 1888.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your article on the recent collision between two passenger trains at the west end of the Bergen tunnel will prove of interest to railroad officers, but, in justice to the Erie, I would like to say a word about the use of a distant signal, and I speak from my own experience and the rule of the British Board of Trade Inspectors.

It has been proved almost to a certainty that distant signals do not furnish absolute protection to trains standing at home signals. When the block system was first introduced, operators were permitted to give "line clear" for a following train when the preceding train was protected by a home and distant signal. Several disastrous collisions occurred and then operators were only permitted to give "line clear" when trains were protected by at least starting, home and distant signal. This is sometimes modified to the extent of allowing "line clear" to be given when a train has taken the starting signal and *is* proceeding into the section ahead.

At such a point as the junction west of Bergen tunnel I have found that the use of a distant signal does not facilitate the movement of trains, and as it does not give absolute protection to standing trains I do not recommend it.

You mention the use of a "fixed" distant signal. If by this you mean a signal that always remains at "caution," I quite concur. The object of such a distant signal is to notify enginemen that they are approaching a dangerous point and must slow up accordingly, and not only be prepared to stop at the home signal, but short of any train that may be standing there. Such a signal only requires a post, blade and lamp, and answers about the same purpose as the boards notifying enginemen that they are so many feet from a drawbridge or grade crossing.

The only sure way to prevent such collisions is the use of the block system, in which the Erie has made a good start.

CHARLES R. JOHNSON.

[We did not use the words distant and fixed with sufficient regard for their precise technical meaning. What we intended to say was that there should have been a *signal* in position west of the overhead bridge abutments to protect trains waiting for the clear signal at the junction. This signal might be worked from the junction tower or not as found best. The thing to accomplish is to protect the standing train.—EDITOR RAILROAD GAZETTE.]

A Railroad Culvert.*

In Putnam County, Indiana, between Raccoon and Russellville, the Indianapolis, Decatur & Springfield Railway crosses Nichol's Hollow on a three-story wooden trestle about 450 ft. long and 67 ft. high, with 18 bents spaced generally 25 ft. centre to centre, the location being on a 3 degree curve.

Two years ago the question of renewal came up, and I thought you might be interested in the story of what we concluded to do in the premises, and how we are now doing it.

The question presented itself in about this shape:

Plan 1—Estimated cost of a new wooden trestle	$6,000
Plan 2—Cost of 75,000 cu. yds. earth filling at 10c	$7,500
Cost of 465 cu. yds. culvert masonry at $7	3,255
Total cost Plan 2	$10,755
Plan 3—Estimated cost of an iron trestle	15,000

Assuming annual renewals to the wooden structure at a minimum of 10 per cent. on first cost, and capitalizing this annual charge at 6 per cent. gives a capital of $10,000, so that in this respect plans one and two compare closely with each other. Our management, however, was willing to incur considerable extra expense, if thereby they could secure good and substantial work, and were as willing to adopt as I to recommend the plan of an arch culvert and an earthwork embankment. Ten cents per yard for earth filling may seem pretty low to some of you, but we based our figures on past experience, of which I shall have more to say hereafter.

We had a spur track into a good sandstone quarry about two miles from the work, and we accepted an offer of dimension stone at $1.50 per yard loaded on the cars and measured in the work. The stone was of a gray color, and in some respects resembled the Berea stone of Ohio. It quarries in blocks of large size without flaw or seam, is at first soft and easily worked, but hardens by exposure. I had some large sized samples tested at our shops on our 200-ton driving wheel press and found its crushing strength to be quite uniform, averaging about 250 tons per square foot, rather lower than Berea stone but still strong enough for the purpose, especially considering its uniformity of strength. Some of our bridge abutments had been built with this stone in 1878, and an inspection of them was favorable to its further use.

Mr. Hill gives a table of tests of three different stones. The average results of four specimens of each were:

	Cracked. Tons per sq. ft.	Crushed. Tons per sq. ft.
Raccoon sandstone	119	251
Bedford oolitic sandstone	140	331
Greensburg limestone	432	834

By what rule should we determine the area of waterway in culvert construction? Probably the best course to pursue is to estimate approximately the drainage area and apply all known formulæ, and then to inspect the country, and particularly any bridges that exist further up the stream, looking for the various evidences of high water, and finally to make a judicious guess at the proper area, taking the side of safety in all cases of doubt. I do not mean to decry the use of the formulæ, but their abuse. They should be used cautiously, and be regarded rather as aids and checks than as final authority. In this case I followed the stream to its source and approximately determined its drainage area, which I was enabled to do with sufficient accuracy in a single afternoon by locating various controlling points by inquiry as to the section, quarter-section, etc., in which they were situated, and 2½ square miles or 1,600 acres was a liberal estimate of the area drained.

The formula of Col. E. T. D. Myers, as quoted in Cleemann's Railroad Engineers' Practice, is

$$\text{Area of waterway in square ft.} = C\sqrt{\text{Drainage Area in Acres}},$$

with C taken at 1.6 in hilly compact ground, at 1 in comparatively flat ground, and as high as 4 in mountainous country. The waterway for 1,600 acres, determined as above, will vary from 40 to 160 sq. ft., depending on the values assigned to C. This formula is discussed editorially in the *Railroad Gazette* (article reprinted in *Engineering News* for Sept. 18, 1886) and for large drainage areas probably gives excessive results and should be used with caution. This editorial deserves careful reading from all interested in the subject; in closing, the writer recommends the following formula: "Guess at the proper size and then double the result for safety."

The original plan called for a semicircular arch about 200 ft. long, 6 ft. span, area of waterway about 32 sq. ft., on a grade of 15 in. per 100 ft., which by Trautwine's formulæ and tables (Edition 1885, pages 274 and 276) indicates a carrying capacity of 442 cu. ft. per second, or about 13.8 cu. ft. per second per square foot of area of opening when flowing full. When built the opening was increased to about 35 sq. ft. of area for reasons explained hereafter, corresponding to a maximum capacity of about 485 cu. ft. per second, and sufficient for a rainfall of 3¼ inches per hour by Trautwine's formula, C being taken equal to 0.3, but for a rainfall of only 1⅝ in. by the formula of the culvert pipe makers (assuming their data to apply to such large areas) and corresponding to the assumption in Myers' formula of $C = \frac{1}{6}$, which is lower than any value advised by him. Sixteen hundred acres, however, was probably in excess, and several years observation by the road department had failed to discover more than from 12 to 15 sq. ft. of cross section passing in times of highest water, and as the structure could probably run under a considerable head for a reasonable time without injury, I saw no reason for adopting larger dimensions.

I would suggest as a practical method of culvert proportioning that observations be made at the given locality to determine for a known amount of rainfall per hour the corresponding depth of water at its highest stage. Observations of a few storms would probably show a nearly uniform ratio existing between the volume of water passing and the inches of rainfall per hour. We could then assume a maxi-

* Extracts from a paper by E. A. Hill, Chief Engineer, Indianapolis & Decatur Railway, read before the Illinois Society of Civil Engineers and Surveyors, Jan. 25-27, 1888.

mum fall of, say, 3 in. per hour and compute our required culvert capacity by simple proportion. No elaborate instruments would be required, and the observations could be made by section foremen on constructed line, and by members of the engineer corps on new construction. I think in this way we would eliminate much of the uncertainty which follows from the use of the various formulæ, and, for my own part, I intend to try the method on my next culvert.

The first plan called for a pavement or flagging of large, flat stones 1 ft. thick, on which the side walls were started 3 ft. high, 3 ft. 3 in. thick at base, and battered 2 in. per foot at back, from which a semi-circular arch of 3-ft. rise and 6-ft. span was sprung with an arch ring of 18 in. depth and backing carried up 2 ft. above the spring line. Cut stone work, with dressed joints and beds, was specified throughout, ranged work outside and broken courses within. The wing walls were regularly stepped down in courses 1 ft. thick, and were rounded into the side walls. This latter feature was accomplished by causing the face of the wing walls (battered 1½ in. per foot) to intersect the side walls at the spring line of the arch. This would naturally cause the battered face of the wing to project in front of the culvert opening, but by cutting away this projecting portion so as to round the wing walls into the side walls, the junction between wings and sides was effected without leaving any angle to catch floating timber and other obstructions. Moreover, such a rounded or funnel-shaped entrance for the water adds materially to the capacity of the culvert when running under a head.

I think this method of construction has only to be understood to be widely adopted. Eighteen inches is a rather unusual depth for an arch ring of 6-ft. span, but was adopted because of the height of bank (67 ft. from bed of brook), the somewhat low crushing values found for the stone, and because the extra depth added but little to cost compared with the extra strength thereby obtained. The proportions of the culvert were fixed approximately by Trautwine's rules, and those finally adopted were checked by comparison with the practice of the Pennsylvania and West Shore railroads for similar spans and found to correspond closely; lines of pressures were then drawn for the arch both unloaded and with full load of earth and train, assuming weight of earth at 130 lbs. per cubic foot, and train load, distributed by crossties 8 ft. long, as equivalent to three extra feet of filling corresponding to 3,360 lbs. per lineal foot of train.

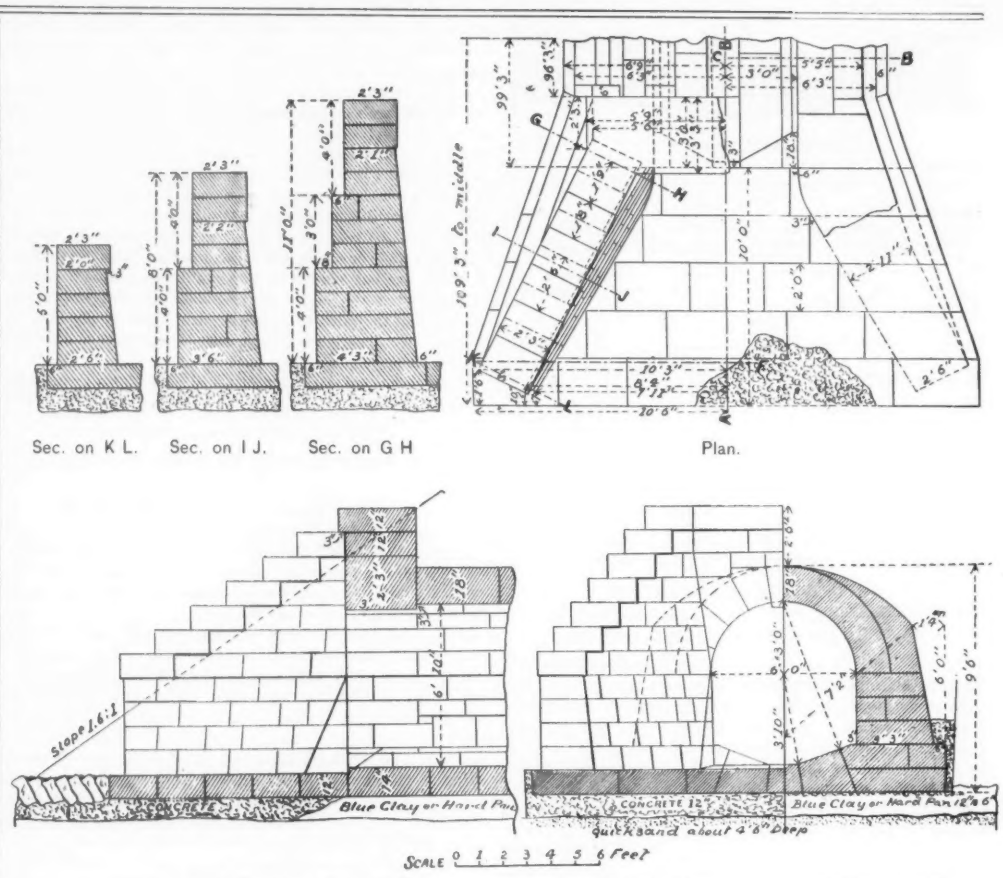
From some excavations made in 1886 I inferred we should have a stratum of tough blue clay of unknown thickness on which to start our foundation course. I suggested a series of test borings along the selected site, but there were no tools at hand for the work, and the company thought it an unnecessary expense.

Construction work was finally postponed until last June, when we commenced excavating on the plan already outlined. The railroad runs approximately east and west, and the brook north and south. I located the arch in the space between the trestle bents just east of that occupied by the brook so as to straighten the channel. Here we had an undisturbed stratum of earth with a surface six or seven feet above the bed of the brook, giving supporting side walls of compacted earth for about 130 feet along the lower end of the arch, the plan being to begin at lower end with a drainage ditch leading south into the brook below, and so advance north with the work, thus avoiding trouble with water by draining through the completed culvert.

The location called for about 1 ft. of excavation in the blue clay, but while excavating for the wings of the south portal, and when only 8 in. of clay had been removed, we came upon a bed of bad quicksand between 4 and 5 ft. deep, apparently extending northward under the entire work. This led to a radical change in plan, an invert was substituted for the flagging or paving, and the entire structure was raised one foot in order to interpose the undisturbed layer of blue clay between the quicksand and bottom of invert. Where this clay had been removed and the quicksand partly exposed we filled in carefully with spalls, on which foundation we spread about one foot of concrete, and upon this laid our invert and foundation courses. The invert was carried in from the south portal with carefully cut stone work for about 40 ft., but a series of test borings proved that going north along centre line of culvert the clay increased and the quicksand decreased in thickness. I therefore for the remainder of the distance laid the invert in rubble, well grouted with Alsen Portland cement mortar, using 4 of sand to 1 of cement, until the grout came to within about 4 in. of the upper surface of invert, and then finishing with a grout of 2 sand to 1 of cement where exposed to running water. An invert as a bottom for a culvert has this advantage among others of concentrating the flow at low stages of water and so tends to keep the water-way free from obstruction.

I will not describe the modified arch in detail, as the plans speak for themselves. It is in the main the original plan modified by the invert, and so has a little more area of waterway than at first intended. It is located on a pretty steep grade, 1¼ ft. per 100 (the average grade of brook).

To build cheaply material must be handled cheaply. We had accumulated from bridge repairs a number of 20-ft sticks of timber, size 6 × 15; with these we built at east end of trestle and level with the track a platform, and from it a chute running down the bank on which to unload and slide the stone. Six timbers laid flatways side by side with two timbers edgeways for sides gave us a chute 7 ft. 6 in. wide supported on cross ties of same material spaced 10 ft. between centres, each timber drift-bolted to each tie and bolted laterally through all with inch bolts 8 ft. 6 in. long. Five lengths of 20 ft. each gave us a total length of 100 ft. and fall of 60 ft., being at an angle of about 37 degrees or slope of 1¼ to 1. This chute carried over 600 tons of stone—all that



CULVERT ON THE INDIANAPOLIS, DECATUR & SPRINGFIELD RAILWAY.

EDWIN A. HILL, *Chief Engineer.*

was used on the work, mostly in blocks weighing from 1 to 3 tons, without needing repairs and with no very great wear. Stones were unloaded from the local freight trains at the top of the chute, handled there by two men with bars and gas pipe rollers and allowed to slide down by their own weight, and received at lower end in a bank of sand and old railroad ties, in order to break the force of fall. There they were swung by a small derrick clear of the following stone and over on to a push car and were at once run off by hand on a temporary track to the work, where they were placed for cutting, and subsequently swung into place on the wall by another derrick. The derricks we had on hand. The cost of labor for setting them up, building chute and a shed for use of cutters in rainy weather was only $14.63. Tracklaying $7.70. Roofing of shed was of fence material afterwards used in fence construction. Track material subsequently went into side track construction, and the other material used was condemned bridge stuff. This expenditure of $22.03 paid for itself many times before the completion of the work, and did much to keep down the total cost.

At intervals of 40 ft. or so 4-in. square stakes were driven on centre line of culvert with top to grade of upper surface of key of invert. Centres were fixed by driving nails, and a mason's line was stretched from nail to nail. The key of invert was then laid in line and grade by this line; and as the work advanced a 6-ft. tram or template placed on the invert with central notch over the central line and properly leveled gave at once the outline of invert and location of walls. The tram was used, however, in the cut work only, but line and grade was given throughout as above stated. The construction of the arch centres calls for no comment further than that they were supported from the floor of water-way instead of from a projection at the spring line as is usually the case.

Our trench, 15 ft. wide, was carried through a clear space of 24 ft. between trestle bents at a depth of 6 ft. below surface, trains running at a height of 66 ft. overhead. We here used for sheet piling (to keep earth from caving under sills of trestle) plank 1¼ × 6 in., driven 18 ft. at bottom into a tough clay and braced at top by old bridge timbers, dimensions 7 × 13 in., placed at the plumb and batter posts of the trestle. When the excavation progressed north so as to cut through into the channel of the brook near its westward deflection we built a temporary dam, turning the water still farther westward and completely out of our way, tearing away the dam on completion of the work. Old bridge timbers and the natural soil were our materials for dam construction.

Excavation for masonry was begun June 15, 1887, and the culvert was finished last October. Filling by steam shovel and unloading plough began Oct. 10, 1887. The culvert proper contained 613 cubic yards of masonry and 24¾ yards of concrete. Masonry cost $4.09 per yard for labor, and $2.50 for material, or a total of $6.57 per yard. Concrete (for labor only) cost $1.78 per yard. Stone quarrying was by contract, all other work by days' wages.

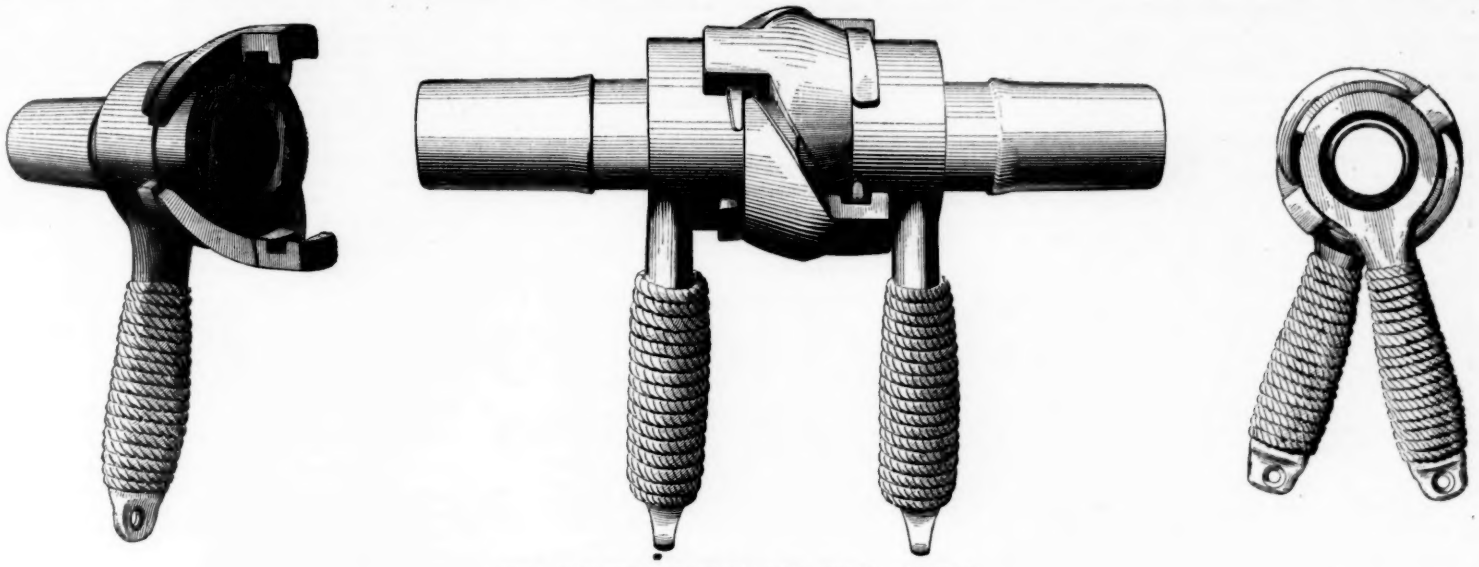
The work was carefully pointed inside and out with cement mortar, and the extrados of arch likewise received a good coating. With Portland cement we used four of sand to one of cement for interior work, and two of sand and one of cement where exposed to weather or water. Louisville cement we used two to one throughout. In special places we used as high as one to one of Portland. The arch ring was set entirely in Portland, mixed usually two of sand to one of cement.

For cement testing our people objected to paying from $75 to $150 for a testing machine, and we built one at our shops at an expense of $15 that answered well enough, its essential elements being an ordinary spring balance with rotary index hand, weighing by ounces up to 30 lbs., or 480 oz., and a lever connection by which each ounce on scale represented 1 lb. stress on the briquette of cement. All unregistered weight was taken off the briquette by a counter weight and cord carried over a pulley, and the briquettes were ruptured by a lever and the pressure registered by a tell-tale index hand. I am convinced that the slight errors of such a machine are far within the ordinary variations caused by differences in the ramming of the cement, and that it is as good for all practical purposes as any of the high-priced machines.

STEAM-SHOVEL WORK.

I have written a long paper, but feel I ought not to close without saying something about steam-shovel work. With good management a shovel will accomplish much at a minimum cost, while with poor management the little that is done will be at a cost so unreasonably large as to create a prejudice against the shovel often difficult to overcome. From what I have seen of shovel work I should invariably have the shovel, plow, engine and flat cars overhauled and put in thorough repair before beginning a job of work. Delays will be many even when this is done, and each delay means an expensive plant and a gang of men idle and a heavy expense. It is important also to strike a proper balance between the work of the shovel crew and train crew respectively, so that neither will have to lose time while waiting for the other. As a rule the length of haul is a fixed quantity, and the maximum economy will occur when the shovel has trains always ready when it is ready to work, and the trains find the shovel always ready to load on their arrival. In practice we should approximate as closely to this state of affairs as possible. We should aim to move the shovel while trains are unloading, and to accomplish this it will sometimes be advisable, within moderate limits, to fix the number of cars loaded per train by the height of bank in which the shovel is working. With a short haul and a low bank we may put in as many flats as the shovel can load in one shift, say fifteen to twenty-five, depending on hauling capacity of engine over the given grades, etc., and then occupy the time the train is away in shifting for next load. With a longer haul and higher bank a few extra flats could be left for the shovel to work on after shifting and before arrival of train; and with a still longer haul and lighter bank two trains could be used, one loading at the shovel while the other unloads at the work.

It is well to have a competent and energetic man on the ground in charge, paying him a generous compensation and looking to him to get the maximum of work possible out of the plant and crews. Our foreman is an old freight conductor who acts as engineer at the shovel and conductor on the train, and is in command of both train and shovel crews, receiving $125 per month, and is emphatically the right man in the right place, and a valuable man for the company.



THE McELROY COUPLER FOR STEAM HEATING.

Even with the best of crews and foremen, a close daily supervision is indispensable in order to keep the plant up to its full duty.

We began filling in our trestle Oct. 10, 1887, and stopped for the winter Dec. 2, 1887. Our shovel is of the Otis type, built by John Souther & Co.; cuts about 24 ft. wide to a depth of 4 ft. below the track. We have been working in a bank about 12 ft. high and loading 12 flats for a train load. Shifting shovel occupies about 5 minutes. Our haul averages about 4,000 ft. Under ordinary circumstances it takes about 15 minutes to handle the cable and plow off, but by an ingenious contrivance for loading the cable, devised by Mr. B. Fagan, our foreman of bride repairs, we have reduced the total time of unloading to about 5 or 6 minutes.

Our usual complement of men consists of a foreman in charge of the work, who acts as train conductor and engineer of shovel, at $125 per month; a cranesman at $2 to $2.50 per day; a foreman for shovel at $1.50 per day; four pitmen, who clean after the shovel, assist in moving it, and in clearing the tracks and handling the cable in plowing off, each at $1.25 per day; and one watchman at $1 per day.

We have thus far handled 2,612 car-loads or about 21,000 cubic yards of earth filling, at a cost for labor, repairs and supplies of 59¾ cents per car, or 7½ cents per cubic yard. We have loaded as many as 124 cars per day, and have averaged 68 cars per day, summer and winter. Our average expense for loading merely, which includes wages of shovel crew, repairs to plant and about one-third of the supplies, is about 40 cents per car-load, or about 5 cents per cubic yard. Total expense for loading, transporting about one mile, unloading with plow and distributing on bank when necessary, is about 57 cents per car-load, or 8 cents per yard, which includes all possible expense except interest on cost of plant. On our third job, under favorable conditions, we have a record of 47½ cents per car-load, or about 6 cents per yard, which was a job of trestle filling at the Sangamon River, near Decatur.

The McElroy Steam Heating Coupler.

The accompanying illustrations represent the latest form of this coupler, concerning which the accompanying resolution was passed at a meeting held in New York on May 17:

"In order to forward the matter of equipping cars for steam heat, the roads here represented, which mutually interchange cars, adopt for the present the McElroy coupler in view of its meritorious features. It is recommended to the careful consideration of the Master Car-Builders' Association."

This resolution was carried unanimously by representatives of the following railroads: Philadelphia & Reading; Lehigh Valley; New York, Lake Erie & Western and Delaware & Hudson.

The handles of the coupler are attached to rings which rotate on what may be termed the main part of the coupler. These rings carry the spiral splines as shown, while the lugs engaging with these splines are solid with the main body of the coupler. The construction is simple, and, though difficult to show in an engraving, is readily understood by an examination of an actual coupler.

One great merit claimed for this coupler is the manner in which the method of clamping the faces together takes up wear. It will be seen from the end view that the handles, when the couplers are tightly clamped together, stand at an incline from the vertical. As they move towards one another to tighten the connection, the jerks and oscillation of the train tend to allow the handles to still further tighten the coupling.

It will be seen that in this coupler the hose is not bent in coupling and is but slightly twisted, and that the coupler need not necessarily hang down, thus avoiding or minimizing the pocket or dip in which water can lodge.

The handles of the coupler are fastened to chains attached to the cars, and the handles are thus rotated when the cars are separated, enabling the coupler to part automatically when the cars are uncoupled. The coupler is made either in brass or malleable iron.

Train Accidents in April.

COLLISIONS.

REAR.

4th, on Kansas City, St. Joseph & Council Bluffs, near Sugar Loaf, Mo., freight train broke in two and rear section ran into forward one, doing some damage, and killing a trainman.

5th, on Chicago, St. Paul, Minneapolis & Omaha, at Boardman, Wis., a stalled passenger train was run into by a following freight train, wrecking engine and 2 passenger cars; 1 passenger injured.

5th, on Burlington & Missouri River, in Atchison, Kan., passenger train ran over a misplaced switch and into a freight train standing on a side track, damaging the engines of both trains.

6th, on Pittsburgh, Cincinnati & St. Louis, at New Cumberland Junction, O., a freight train ran into a preceding freight which had stopped to do some switching, disabling engine and damaging 5 cars.

6th, on California Southern, at Colton, Cal., a freight train broke in two and the rear portion ran back and collided with a following freight train, piling up the engine and several cars in a bad wreck, which caught fire and was partially consumed.

7th, on New York, Lake Erie & Western, near Otterkill, N. Y., freight train ran into a preceding freight, wrecking engine, caboose and 10 cars.

8th, on Chicago, Burlington & Quincy, near Monmouth, Ill., passenger train ran into a car loaded with lumber standing on the main track, damaging the engine.

10th, on Chicago & Northwestern, near Beloit, Wis., passenger train ran into the rear of a freight train which had broken in two on a curve, wrecking engine, caboose and several cars; fireman slightly injured by jumping.

10th, night, on Central of New Jersey, at Cranford, N. J., a coal train ran into a preceding coal train, wrecking engine and caboose and derailing 16 cars.

12th, night, on Central Pacific, at Newcastle, Cal., a freight train ran into a preceding freight, damaging engine, caboose and several cars.

12th, on Louisville & Nashville, at Elmore, Ala., freight train ran into a preceding freight, damaging engine and caboose.

12th, evening, on Connecticut River, at Bellows Falls, Vt., passenger train ran over a purposely misplaced switch and into a freight car standing on a side track, wrecking it and derailing and damaging the engine.

14th, on St. Louis & San Francisco, at Tuskahoma, I. T., passenger train ran into a car loaded with lumber standing on the main track and the engine and several cars were derailed and badly wrecked; engineer and fireman killed.

14th, on New York Central & Hudson River, at Brockport, N. Y., a freight train was turned into a side track by a misplaced switch and collided with some cars which were being unloaded, doing some damage.

17th, near Clarion Junction, Pa., a New York, Lake Erie & Western freight train was run into by a Buffalo, Rochester & Pittsburgh freight, which road there uses the Erie tracks, damaging engine and caboose.

18th, on Philadelphia & Reading, in Reading, Pa., a freight train ran into a preceding freight, doing considerable damage.

18th, on Southern Pacific, in Los Angeles, Cal., a yard engine ran into a string of freight cars and, with 5 cars, was badly damaged.

23d, on East Tennessee, Virginia & Georgia, near Dalton, Ga., a derailed freight train was run into by a closely following freight, wrecking an engine and 16 cars; 2 trainmen injured.

24th, on Pennsylvania, at Frazer, Pa., a freight train ran into the rear of a switching freight, owing to a misunderstanding of signal, disabling engine and damaging several cars; brakeman slightly injured.

26th, on Philadelphia & Reading, near Woodbourne, Pa., a freight train ran into a preceding freight, wrecking an engine and 12 cars; 2 trainmen killed.

26th, on Milwaukee, Lake Shore & Western, at Birnamwood, Wis., freight train ran into a construction train which was going on to a sidetrack, wrecking engine, caboose and 1 car; injuring 15 laborers.

27th, on Florida Railway & Navigation Co.'s road, near Ocala, Fla., freight train broke in two and the rear portion ran back down grade and collided with a following freight train, doing considerable damage.

27th, on New York & Brooklyn Bridge road, passenger train standing at the station in New York was run into by an approaching train which, it is said, disregarded a flag which was sent out. Two passengers were injured.

BUTTING.

2d, on Chicago & Northwestern, near Innary, Ia., butting collision between two freight trains, wrecked both engines and 10 loaded stock cars; 3 trainmen and a man in charge of stock were injured. The train dispatcher is said to be responsible for the accident.

3d, on Delaware & Hudson Canal Co.'s road, near Harpersville, N. Y., butting collision between two coal trains, owing to a mistake in orders, wrecked both engines and 10 cars; 1 trainman injured.

4th, night, on Chicago, Burlington & Northern, near Fountain City, Wis., butting collision between a passenger train and a freight, overturning the engine of the former.

4th, on Southern Pacific, in a tunnel near San Fernando, Cal., butting collision between a freight train, drawn by 2 engines, and a construction train, wrecking 3 locomotives and 12 cars; 2 trainmen killed and 6 laborers injured. The gravel train was running on the freight's time.

5th, night, on Missouri Pacific, near Leavenworth, Kan., butting collision between two freight trains wrecked both engines and several cars.

9th, on East Tennessee, Virginia & Georgia, near Silver Creek, Ga., butting collision between two freight trains, damaging the engines and several cars; 5 trainmen and a tramp injured.

11th, on Western New York & Pennsylvania, at Cuba, N. Y., butting collision between two engines.

12th, early, on New York, Lake Erie & Western, near Bradford, Pa., a butting collision between a passenger train and a freight badly wrecked both engines and the greater portion of the latter train; 1 trainman and several passengers injured.

12th, on Chicago & Northwestern, near Maple River Junction, Ia., butting collision between two freight trains, disabling both engines.

14th, on Burlington & Missouri River, in Beatrice, Neb., butting collision between a freight train and a switching freight, damaging one engine and several cars.

14th, in Dayton, O., a Pittsburgh, Cincinnati & St. Louis passenger train ran over a misplaced switch and into the head of a Cincinnati, Hamilton & Dayton freight, damaging both engines and injuring a trainman.

15th, on Chicago, Burlington & Quincy, near Creston, Ia., butting collision between a passenger train and a freight, totally wrecking both engines and several cars in each train. Two mail cars caught fire and, with a bridge, were burned up. One trainman killed, 3 injured. It is said that the freight conductor was asleep when he passed the station where he should have stopped; and it is also said that he had been on duty 54 hours.

16th, on Burlington & Missouri River, at Kesterson, Neb., butting collision between a passenger train and a freight, wrecking both engines and damaging several cars.

16th, on Southern Pacific, near Los Angeles, Cal., butting collision between a freight train and two locomotives coupled together wrecked all 3 engines and several cars.

21st, on Boston & Lowell, near Plymouth, N. H., butting collision between a freight train and a switching engine damaged both locomotives and injured 2 trainmen.

23d, on New York, Lake Erie & Western, near Callicoon, N. Y., butting collision between two freight trains, owing to misconstrued orders, wrecked both engines and 12 cars; 1 trainman injured.

25th, on Chicago, Rock Island & Pacific, at Givin, Ia., butting collision between a freight and a construction train, damaging both engines.

26th, on Lake Shore & Michigan Southern, at Painesville, O., a freight train ran over a misplaced switch and into the head of another freight standing on a side track, damaging both engines and several cars; 2 trainmen slightly injured.

27th, on Central, of New Jersey, at Perth Amboy, N. J., butting collision between two freight trains, due to a misplaced switch, damaging the engines and several cars. A conductor was seriously injured by jumping.

30th, on Chicago, Milwaukee & St. Paul, near Wauwatosa, Wis., several freight cars which had been left on a side track with the brakes insecurely set were blown out upon the main track by high wind and ran down grade into the head of a passenger train; engine damaged, fireman slightly injured.

CROSSING AND MISCELLANEOUS.

11th, on the Union Stock Yards tracks, in Chicago, Ill., an Illinois Central freight train ran into a Chicago, Burlington & Quincy freight train, derailing and damaging the engine of the latter.

15th, about 4 a. m., on Pennsylvania, in the yard at West Philadelphia, Pa., an empty engine moving backward dashed into the side of a rapidly moving passenger train, striking the tender of the passenger engine, which, with the mail, baggage, 2 express, and a sleeping car, was overturned and badly damaged, the empty engine being thrown down an embankment; 1 trainman killed, 3 trainmen and 19 passengers injured. The runner of the empty engine, who was moving out of a side track and should have followed the passenger train, apparently disregarded a semaphore signal.

18th, very early, at the crossing in New Hampton, Ia., a Chicago, St. Paul & Kansas City passenger train ran into a Chicago, Milwaukee & St. Paul freight train, wrecking several cars of the latter and damaging engine and tender of the passenger train. One trainman injured. Failure of air brakes is given as the cause.

19th, at the crossing near Ft. Worth, Tex., a Gulf, Colorado & Santa Fe freight train collided with a Texas & Pacific stock train, wrecking engine and several cars.

26th, at Mountain View, N. J., a Delaware, Lackawanna & Western coal train ran into the locomotive of a New York

& Greenwood Lake passenger train, damaging both engines.

27th, on Burlington & Missouri River, at Wilber, Neb., several cars of a passenger train were damaged and one car derailed by a flat car which projected over the main track from a siding; two passengers injured.

DERAILMENTS.

DEFECTS OF ROAD.

2d, on Central of Georgia, near Columbus, Ga., an accommodation train was thrown from the track by the spreading of the rails and badly damaged.

9th, on Denver & Rio Grande, near Price, Utah, passenger train was thrown from the track by the spreading of the rails; two trainmen injured.

12th, on Bradford, Eldred & Cuba, near Wellsville, N. Y., freight train derailed on a trestle which had been weakened by a freshet. Engine and 3 cars were tipped over into the meadow below. Two brakemen were injured.

20th, on Petersburgh road, near Stony Creek, Va., engine and 6 cars of a freight train went through a bridge which was undergoing repairs and were badly wrecked.

24th, on Hartford & Connecticut Western, in Winsted, Ct., engine and forward truck of baggage car in a passenger train were derailed by a defective switch.

24th, on New York Central & Hudson River, near Pittsford, N. Y., 11 cars of a freight train were thrown from the track by the spreading of the rails.

27th, on Burlington & Missouri River, near Alma, Neb., passenger train wrecked by the breaking of a bridge; one passenger killed. The mail and express cars caught fire and were consumed.

27th, on Texas & Pacific, near Savoy, Tex., a freight train broke through a bridge weakened by a freshet, nine cars being wrecked.

28th, on Western New York & Pennsylvania, near Portville, N. Y., a passenger train was derailed by the spreading of the rails, which had been expanded by sudden hot weather, and the mail, baggage and two passenger cars were thrown down an embankment into a stream, injuring 20 passengers and five employés.

29th, on Wilmington & Weldon, near Enfield, N. C., passenger train thrown from the track by the spreading of the rails, injuring one trainman and four passengers.

29th, on Missouri Pacific, near St. Joe, Tex., engine of construction train went through a bridge, the foundations of which had been weakened by heavy rains, injuring an employé.

30th, on Minneapolis, Sault Ste. Marie & Atlantic, at Bruce, Wis., freight train wrecked by a broken bridge.

DEFECTS OF EQUIPMENT.

1st, on Illinois Central, near Duquoin, Ill., 6 cars of a freight train were derailed and 4 cars badly wrecked by a part of a tender truck falling upon the track.

1st, on Duluth, South Shore & Atlantic, near Rock River, Mich., 7 cars of an ore train were derailed by a broken wheel on a bridge and thrown into the river, wrecking them completely and badly damaging the bridge.

3d, on Central of Georgia, near Albany, Ga., passenger train derailed and several cars wrecked by the breaking of an axle under a baggage car; 1 trainman and 1 passenger injured.

4th, on Pennsylvania, near Bennington, Pa., 7 cars of a freight train were derailed and wrecked by the breaking of an axle; 2 trainmen injured.

4th, night, on South Carolina, at Elko, S. C., freight train derailed by a broken truck and several cars wrecked; 4 trainmen injured.

13th, on Southern Pacific, at Whitewater, Cal., 5 cars of a freight train were derailed by the dropping of a brake-beam.

20th, on Atchison, Topeka & Santa Fe, near Augusta, Kan., 15 freight cars in a mixed train were derailed and wrecked by the dropping of a brake-beam.

28th, on Jeffersonville, Madison & Indianapolis, at Sellersburg, Ind., 10 cars of a freight train were derailed by the breaking of a truck, 5 being badly wrecked.

NEGLIGENCE IN OPERATING.

4th, on Southern Pacific, near Benson, Ariz., freight train derailed by a misplaced switch, damaging the engine and injuring the fireman.

5th, on Florida Railway & Navigation Co.'s road, near Fernandina, Fla., engine and several cars of a freight train went through an open draw bridge into Amelia River, tearing down a portion of the structure and demolishing a passing boat. It is said that the runner neglected to make the customary stop before crossing the bridge. One trainman injured.

6th, on Southern Pacific, at San Pedro, Cal., engine derailed by a misplaced switch.

9th, on Chicago & Northwestern, near Ripon, Wis., engine of passenger train was derailed by a switch which section men in making repairs had left wrong.

11th, on Burlington & Missouri River, in Lincoln, Neb., engine and 2 cars of a switching freight derailed by a misplaced switch.

12th, night, on Michigan Central, at Bay City, Mich., a mixed train ran over a misplaced switch and part of it was ditched.

13th, on Cincinnati, Wabash & Michigan, near Urbana, Ind., engine and 7 cars of a freight train were derailed by a misplaced switch and badly damaged.

13th, on Chicago, Milwaukee & St. Paul, at Oak Glen, Ill., engine and 10 cars of a stock train were derailed and ditched by a misplaced switch.

13th, on Rome, Watertown & Ogdensburg, in Utica, N. Y., engine and tender of a switching passenger train derailed by a misplaced switch.

16th, on Bennington & Rutland, near Sunderland, Vt., a freight train was derailed by a misplaced swith, the engine and 1 car being overturned.

18th, on Texas & Pacific, near Provencal, La., construction train was derailed and wrecked by a misplaced switch, killing the engineer and fireman.

19th, on Baltimore & Ohio, in Pittsburgh, Pa., as a gondola car containing two heavy rolling mill cylinders was rounding a sharp curve, the cylinders rolled down to the lower side of the car and it was derailed, stripped off its trucks and thrown into the street.

20th, on Atchison, Topeka & Santa Fe, near Winfield, Kan., a freight train ran over a misplaced switch and the engine and 15 cars were derailed and wrecked; 2 trainmen injured.

21st, on New York Central & Hudson River, in Batavia, N. Y., engine and 3 cars of a freight train were derailed by a misplaced switch.

23d, on New York, Pennsylvania & Ohio, near Youngstown, O., passenger train derailed by a misplaced switch, the entire train except the sleeping car leaving the track; engineer injured.

25th, night, on Louisville & Nashville, at Campbellsburg, Ind., engine and several cars of a freight train were derailed by a misplaced switch.

26th, on Chicago, Burlington & Quincy, at West Quincy, Mo., a special train, consisting of engine and 1 car, was derailed by a misplaced switch and ditched; 2 trainmen injured.

27th, on Central Pacific, at Winnemucca, Nev., empty engine derailed at a switch and ditched. It is said that the engineer was running recklessly where he was unacquainted with the location of the switches.

30th, on Atchison, Topeka & Santa Fe, near Socorro, N. M., a construction train in descending a heavy grade could not be controlled, and, after running some distance at high speed, the engine and 4 cars were derailed and ditched.

UNFORESEEN OBSTRUCTIONS.

1st, night, on Chicago, Milwaukee & St. Paul, in Chicago, Ill., engine of passenger train derailed by a purposely misplaced switch.

5th, on New York, Lake Erie & Western, near Griswold, N. Y., freight train ran into a washout, derailing engine and several cars.

5th, very early, on Delaware, Lackawanna & Western, near Leicester, N. Y., engine of passenger train derailed at a point where a culvert had been seriously impaired by a freshet. Engineer and fireman were thrown into a river and drowned.

5th, p. m., on Chicago, Milwaukee & St. Paul, near New Hampton, Ia., passenger train derailed and partly submerged at a creek where high water had moved the bridge from its bearings and washed large cakes of ice upon the track. The cars, falling one on top of the other, were badly wrecked; engineer and 6 passengers killed, 20 passengers injured.

6th, night, on Central Vermont, near Rockingham, Vt., a passenger train derailed on a high embankment, wrecking engine, baggage and express cars, most of these vehicles overturning and falling some 30 ft. The cars caught fire and with their contents were destroyed. The passenger car fell part way down the bank. Engineer and fireman killed and 5 passengers injured. The embankment was on a side hill and a sudden thaw had caused some of the earth to slide away.

6th, night, on Chicago, Burlington & Quincy, in Chicago, Ill., freight train derailed by a purposely misplaced switch, damaging engine and several cars; engineer and fireman injured.

9th, on New York, Lake Erie & Western, near Carrollton, N. Y., a freight train ran over a cow, derailing and damaging 2 engines and 10 cars and killing 40 head of cattle; 1 trainman killed, 4 injured.

10th, night, on Chicago, Milwaukee & St. Paul, near Tomah, Wis., freight train ran into a washout, ditching 17 cars.

11th, on Northern Pacific, near Pasco, W. T., passenger train ran over some cattle and was derailed.

12th, night, on Chicago & Alton, near Jacksonville, Ill., freight train was derailed and engine and 12 cars wrecked. It is said that the track had been maliciously obstructed by fence posts.

13th, on Kansas City, Memphis & Birmingham, near Kings, Ala., a construction train moving backwards ran over a cow and was derailed, killing 4 laborers and injuring 10 others.

16th, on Flint & Pere Marquette, in Detroit, Mich., a car of a passenger train was derailed by a switch misplaced by boys.

23d, on Oregon Railway & Navigation Co.'s road, near Baker City, Or., a freight train ran over a herd of cattle, overturning the engine and derailing several cars; engineer and fireman killed.

29th, on Louisville & Nashville, near Decatur, Ala., freight train was derailed and partially wrecked by a large stone which had fallen from one of the cars upon the track.

UNEXPLAINED.

3d, on East Tennessee, Virginia & Georgia, near Macon, Ga., car of a passenger train derailed on a temporary track built to get around a washout.

6th, on Pittsburgh, Fort Wayne & Chicago, near Upper Sandusky, O., engine and several cars of a freight were derailed.

6th, on Fort Worth & Denver City, at Alvord, Tex., passenger train derailed and several cars wrecked; 1 passenger killed, 1 trainman injured.

7th, on Illinois Central, at Kankakee, Ill., engine and several cars of a passenger train were derailed, slightly injuring several passengers.

9th, on New York, New Haven & Hartford, near Northampton, Mass., tender truck of engine of passenger train derailed.

9th, on Housatonic, near Vandeusenville, Mass., freight train derailed and several cars wrecked.

9th, on Pennsylvania, near Jersey City, Pa., passenger train ran into an engine and caboose, doing considerable damage.

11th, on Mobile & Ohio, at East St. Louis, Mo., passenger train derailed.

11th, on Missouri Pacific, near Lamonte, Mo., freight train derailed and ditched, killing 1 employé and injuring another.

12th, on Grand Rapids & Indiana, near Luther, Mich., passenger train was derailed and thrown into the Little Manistee River; engineer severely injured.

12th, on Northern Pacific, at Lake, Wash. Ter., baggage car of passenger train jumped the track and was overturned, the 4 following cars being derailed.

13th, on Missouri Pacific, near Pottsboro, Tex., the caboose and several cars of a freight train were derailed and thrown down an embankment, injuring 2 trainmen.

15th, on Missouri Pacific, near Winfield, Kan., passenger train derailed, wrecking engine, tender and one car, injuring a passenger.

15th, on Cincinnati, Wabash & Michigan, at Van Buskirk, Ind., engine and 8 cars of a freight train derailed and wrecked.

15th, on Florida Railway & Navigation Co.'s road, near Baldwin, Fla., passenger train derailed and engine and several cars overturned, killing the engineer.

15th, on Manhattan Elevated, at Ninth avenue and Sixtieth street, New York city, rear car of switching passenger train derailed.

18th, on Southern Pacific, in Los Angeles, Cal., switch engine derailed.

20th, on Columbia & Puget Sound, near Seattle, W. T., engine and several cars of a freight train were derailed.

21st, on Boston & Lowell, near Chesham, N. H., freight train derailed.

22d, on Oregon Railway & Navigation Co.'s road, near Pleasant Valley, Or., freight derailed, wrecking engine and several cars; engineer killed and several trainmen injured.

22d, on Louisville & Nashville, at Calera, Ala., freight train derailed and badly damaged, killing a brakeman.

22d, on New York, Lake Erie & Western, near Cameron, N. Y., fast train No. 13, consisting of Wells, Fargo & Co.'s express cars, was derailed while running at high speed. The forward truck of the engine was the first to jump from the track, and the engine and three cars were overturned and badly wrecked. It is said that one of the journals of the engine truck had been running hot for several miles. Engineer and fireman injured.

25th, p. m., on Chicago & Northwestern, near Negaunee, Mich., freight train derailed, wrecking caboose and 16 ore cars.

25th, on Hannibal & St. Joseph, near Breckenridge, Mo., freight train derailed and several cars wrecked. A tramp was killed and two trainmen injured.

27th, on Central of Georgia, at Goggins, Ga., freight train derailed and several cars overturned.

27th, on Cincinnati, Hamilton & Dayton, in Cincinatti, O., a car in a switching freight train was derailed.

27th, on Louisville & Nashville, near Glencoe, Ky., four cars of a freight train derailed, injuring a brakeman.

28th, on Baltimore & Ohio, near Metz, W. Va., engine and one car of an accommodation train were derailed and damaged; two trainmen injured.

28th, on Western of Florida, near Green Cove Springs, Fla., locomotive overturned and damaged, killing an officer of the road.

29th, on Louisville, New Orleans & Texas, near Roxie, Miss., freight train was derailed.

OTHER ACCIDENTS.

6th, on New York, Lake Erie & Western, near Craigville, N. Y., engine of a freight train standing still exploded its boiler, wrecking the engine completely. Three trainmen who were clearing out the sandpipes were killed.

9th, on Atlantic & Pacific, at Carrizo, Ariz., the flues of engine of a freight train collapsed and 4 trainmen were scalded by escaping steam, 2 of them fatally.

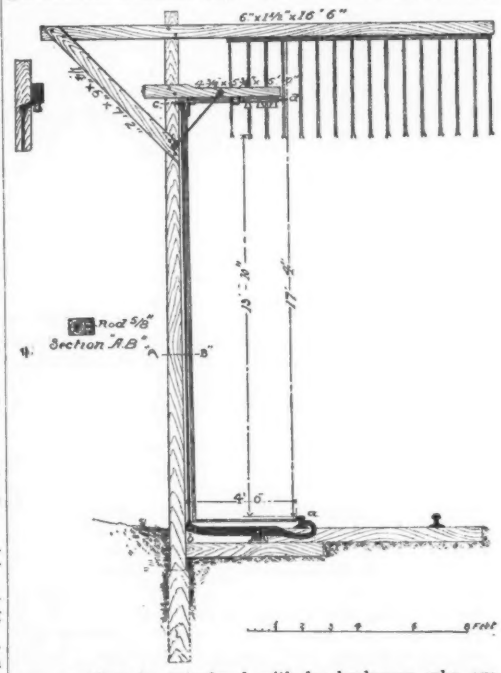
16th, on Baltimore & Ohio, at Rockwood, Pa., a locomotive exploded its boiler, injuring 4 trainmen.

30th, on Louisville & Nashville, near Oxmoor, Ala., engine of passenger train blew out a cylinder head.

A summary will be found in another column.

Bangs' Audible Bridge Guard.

The illustration herewith shows an attachment lately applied to a number of bridge guards on the New York, New Haven & Hartford. The object of the apparatus, as will be readily seen, is to provide a warning which shall appeal to the hearing of brakemen on the tops of freight cars as they approach a dangerous overhead bridge, and thus supplement the ordinary ropes or wires which, as is well known, either get worn out or broken off, or else are thrown up over the



arm or otherwise interfered with by brakemen who are bothered by them. The drawing needs no description, the construction of the apparatus and proportions of parts being clearly shown. Every wheel which passes over the track instrument sets the bells a-jingling at a lively rate, making a sound which cannot be disregarded except wilfully.

The apparatus is the invention of Mr. Oliver Bangs, Superintendent of Bridge Repairs of the Hartford Division, who has applied for a patent.

The South Norwalk Derailment.

The sketches given herewith illustrate some features of a remarkable accident at the South Norwalk drawbridge of the New York, New Haven & Hartford, on Friday morning last. This bridge, it will be remembered, is on the site of the appalling disaster of May 6, 1853, when a train-load of passengers was precipitated into the river, and 46 of them were killed. The west-bound Shore Line express, due at South Norwalk at 5:40 a. m., and consisting of engine, two baggage, two passenger and three sleeping cars, was stopped before crossing the bridge on account of the draw being open for the passage of a vessel. After the vessel had passed,

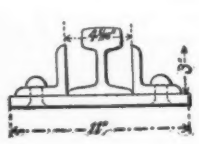


Fig. 1.

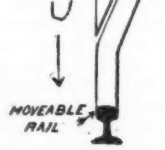


Fig. 2.

the draw-tender closed the bridge and let down the mitred rails at the joint between the draw and the fixed span of the bridge. This joint, as will be explained further on, has nothing to hold it in place but its own weight, and the draw-tender makes a practice of always inspecting it carefully before giving a clear signal. He says that he did so in this case and that the surface of the rail was in proper position. The train, however, on striking this joint was derailed and

ran about 300 ft. on the sleepers. Of this distance 180 ft. was on the draw-span where there are oak guard-timbers bolted to the sleepers and placed 12 in. outside of the rails. The remaining 120 ft. was over a trestle at the west end of the draw-span, where there are no guard-timbers or guard-rails of any kind; but the wheels of the train in no place ran more than 6 or 8 in. from the track, and the guard timbers of the bridge showed only two or three scratches in their entire length. When the train finally stopped the four driving wheels of the engine, all of which had flanges, were found on the rail, but all the other wheels of the train were off, except those of two sleeping cars at the rear, which stopped before they reached the draw span. The ties, which are 8 in. square and spaced 8 in. apart in the clear, were fastened to the guard timbers on the bridge, and on the trestle the rails were fastened to the ties by Bush interlocking bolts. Only two or three of the ties were pushed out of position, the rest remaining firm and undoubtedly serving to keep the wheels of the train in line.

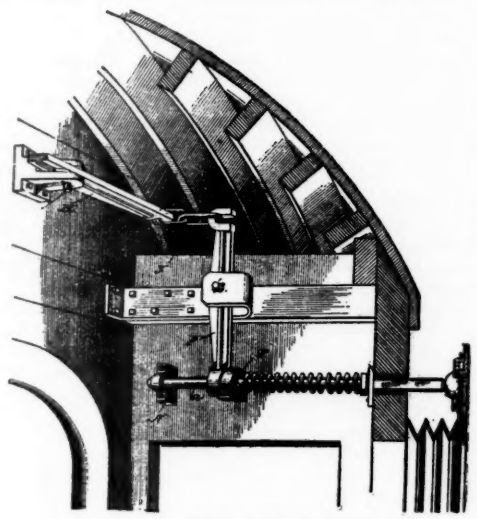
The device at the ends of the draw is intended, as will be seen from the illustration, to provide a smooth riding joint. The necessary space between the movable and fixed spans, together with the provision required for expansion, make, as is well known, the use of an ordinary butt joint very undesirable. The road, it will be understood, is double track, and this mitred joint makes substantially the same break in the track as a trailing-point split-switch. At the end where trains run *off* the bridge the sharpened rail is lifted and the bent rail is spiked down. The rail on the bridge is fastened at the heel to the rail next to it in the ordinary manner and is kept in position laterally by angle irons on either side about 27 ft. long, bolted firmly to the ties, as shown in the sketch. When the draw is to be opened, the rail is lifted the necessary height to clear the shore rail (about 4¼ in.) by a cam bearing on the under side of the moving rail. When the bridge is closed, these cams are turned by means of levers in the bridge-tender's cabin in the centre of the span. The cams raise the rails and permit them to drop into position, but there is nothing to pull the rails down and nothing to hold them down.

The accompanying diagram, fig. 1, shows the movable rail in position between the confining 3-in. angle irons.

Fig. 2, which is not drawn to scale, shows the probable manner in which the accident occurred. The beveled end of the movable rail was evidently struck by a wheel, and therefore must have projected some distance above the top of the fixed rail. If this projecting rail had been struck by the *tread* of the advancing wheel, the rail would simply have been forced down into position, and the train would have passed over without derailment. The projecting point of the movable rail was therefore probably struck by the outer vertical face of the wheel and pushed out laterally, forming a very effective de-railing device.

Vestibule Car Buffers.

The accompanying illustration represents the latest improvement in vestibule buffers as patented by Mr. H. H. Sessions. The general construction of the vestibule and buffers is clearly shown. It will be observed that the buffers are equalized and that the connection between the buffer



Vestibule Buffer, with Equalizers.
Session's Latest Improvement.

face and the buffer spindle is made by means of a ball and socket joint.

This form of construction has just been patented and is a further development of Mr. Sessions' original patent, on which the recent suit for infringement against the Wagner Car Co. was based.

Nashville Meeting of the American Society of Mechanical Engineers.

The Society had a remarkably pleasant trip over the Erie, being the recipients of favors from that company, who ran the party on a special to Port Jervis, and kindly sent their director's car for the use of our ladies as far as Hornellsville. The lovely scenery was at its best, owing to a beautiful day, and the arrival in Cincinnati was not of travel-stained pilgrims, but of light-hearted tourists. The local members, among whom was Mr. Doane, met the party and drove them around the city, and the start for Nashville was made under the most pleasant auspices.

The party reached Nashville about 7.30 a. m., and at 10 proceeded at once to business.

Some of the papers read have already been noticed in these columns. Among those which have not been was "The Printing Press in Mechanical Schools," by John T. Hawkins, which was a plea for its special consideration by professors and instructors in technical schools. The same author then presented a paper on an "Automatic Regulator for Heating Apparatus." This consisted in general of a helical thermostat with two strips of dissimilar metals soldered together, and arranged with the more expansible metal on the inside of the return pipe from the radiator delivering the cooled water into the lower part of the boiler. This thermostat can be adjusted to any desired temperature, and when the water falls below this, the helix, by unwinding, operates a lever which is connected with the damper.

"Estimating the Cost of Foundry Work," by Geo. L. Fowler, was then read. He proposed that the time-keeper should each day take the time of each molder and watch the work upon which he has been engaged. He charges each piece of work with a certain ratio of the fixed expenses determined previously by a careful average of such expenses for some long period. This is then to be added to the cost. Having obtained the sum of these various ratios, he multiplies it by the wages paid, adds to the result the wages and cost of iron in the casting, and brings out the cost of the casting.

H. L. Binsse then followed with a paper "Short Way to Keep Time and Cost." This was effected by means of a chart which showed the kind of work, the worker's name, the wages paid and any special work done. The time-keeper enters the time in its proper square under its proper head, and at the end of the week the hours each man has spent on each subhead are summed up, and their value in money entered on a separate sheet where the cost and weight of the raw materials were kept.

The topical discussion on "Data for Design of Hemp Rope Transmissions" brought out an animated discussion on the form of splices, whether long or short. The discussion was extended, and that settled the question of long splices a great deal as the old Dutch judge settled the weight of evidence, by the "heft" of the authorities each lawyer quoted.

That afternoon the party went to Fiske University and saw something of the noble work which is being done in educating the colored race. This is to be a great normal school to train teachers to labor among the colored people. Like most of their race, they were good musicians, and their voices blended beautifully in some of national songs. From there we went to see the Standard Charcoal Iron & Chemical Co., of which Gen. Warner, formerly of the U. S. Army, is President. The great object of interest here was Dr. Pierce's method of making charcoal. In this he not only obtains 50 bushels of charcoal worth $3, as against the old method which produced but 35 bushels, but he obtains from the by-products 150 lbs. of acetate of lime and 2½ gals. of alcohol, making a total value of $7.55. At present he has seven plants in operation, three in Tennessee, two in Alabama and two in Michigan.

That evening the Society met to receive a formal welcome from the Governor of Tennessee, and we listened to the exuberance of his expressions regarding the glories of his state, which he compared to Paradise. When a later investigation brought us face to face with the country described, we felt as did the Queen of Sheba before Solomon, that the "half had not been told."

An address by Prof. C. M. Woodward, entitled "The Coming Engineer," which was in point of fact a plea for manual training, closed the evening.

The next morning the engineers proceeded to Vanderbilt University. The meeting convened in the chapel and, after an address of welcome from its President, listened to a paper by Prof. R. H. Thurston on "Proportioning Steam Cylinders." It bristled with mathematical formulæ as a porcupine does with quills, and as they shot off one evidently hit Mr. George H. Babcock, who thought the method involved unnecessary calculation.

Mr. W. F. Mattes then read an able paper on "Connecting Rods." The advantages claimed for his design were that the flat parallel sides of the head facilitate forging, the tensile strains are taken up by bolts instead of eyes, so the required strength is readily attainable, the weight is sensibly reduced and the unsightly swelling at the end of the rod is avoided. After a "New Method of Inserting and Securing Crank Pins," by Mr. Collins, which was thought by the members to be rather an elaborate method of doing a simple thing, the discussion seemed to take the shape of the proper allowance for shrinking tires. According to the American Railway Master Mechanics' Association, it seems the average shrinkage for locomotive tires was $\frac{1}{80}$ in. for each foot of diameter. In this connection it was stated that after failing to remove the axle from a locomotive driving wheel by mechanical appliances, it was decided to cut off the tire, when the axle was readily removed by hand, which showed how the compression due to the shrinkage had been transmitted through the spokes to the hub.

After the short session in the Chapel the Society descended to the grounds where it was proposed to lay a corner stone for the new school of mechanical engineering about to be erected. The venerable Bishop McLyeire delivered an address and traced the history of the University.

Leaving the University after a delightful lunch passed in the most delightful company, for Nasbville has the handsomest ladies in the land, the party went to Belle Meade Farm and saw some of the famous racers who have not only a record in this country but are known in England.

After play comes work, and so in the evening hostilities were renewed by various papers, mostly relating to steam boilers and compound engines. "An Electric Speed Recorder," by Mr. Geo. H. Barrus, was extremely interesting. It worked somewhat like a Morse register, having two recording pens, each operated independently by an electro-magnet, which is worked by alternate making and breaking of the circuit. In one case, the oscillating movement of an escapement wheel of a clock is used, breaking 120 times a minute; in the other the revolution of the shaft does it. During one-half the revolution the two ends of the circuit are in contact, and during the other half are separated, giving two parallel lines composed of dots and dashes ⅝ in. apart. This instrument has registered satisfactorily at 300 revolutions to the minute. By drawing perpendicular lines through the centres of the dashes marking the beginning and end of the interval of time, and counting the number of speed dashes and fractions between these lines, the number of revolutions is obtained for the time fixed.

The next morning was occupied with "Surface Condensers" and duty trials of pumping engines; but the topic most interesting to your readers will be the "Distribution of Steam in the Strong Locomotive," by Mr. F. W. Dean, which is given in another column.

"Strains in Locomotive Boilers," by L. S. Randolph, was next considered. This was illustrated by several samples of fractures. The writer considered the principal cause was repeatedly straining the metal beyond its elastic limit.

After several other papers, abstracts of which have appeared in the *Railroad Gazette*, the party went up to see the new reservoir being built on the summit of a high hill over looking the city. The hill is crowned by an outcropping of rock, and this is being drilled and blasted, and put into the wall of the reservoir. It seemed almost like the wonderful provision of nature, by which a large river invariably flows by a large city, that this suitable hill for the reservoir site should contain the rock of the reservoir wall. The reservoir is to contain 50,000,000 gallons, or ten days supply. The wall is 33 ft. high, and seemed solidly built. The shape was an ellipse, the major axis being 603 ft. and the minor axis 463⅛ ft. Believing that the party would be dry in the presence of such a receptacle for water, the contractors, Whitsit & Adams, had thoughtfully provided other fluids, which were very acceptable, as the day was warm and dusty.

As Nashville has no "watering places," as we know the term, she has provided herself with pretty summer parks for picnics, etc., and to one of those the party went, being joined by our ladies en route, they having been entertained at a lunch party while we inspected the reservoir. Later, the session was resumed, and many other papers read and discussed, and well-deserved votes of thanks were given to our kind hosts.

On the next day a special train took us to South Pittsburgh, located in the Sequachee Valley, 130 miles from Nashville. The place is most beautifully located, and seems walled in by the mountains, the gorge on the northwest side acting as a sort of ventilating opening through which cool breezes flow. The mean annual temperature is stated to be 68°. Coal and iron are most abundant, the former being in a 4-ft. seam, and the latter, it was stated, would make Bessemer pig. By the way, this statement was made everywhere we went. It may be here remarked, so will any iron ore; but the question which is never brought out till an investigation is made is, at what expense? That this ore contains considerable phosphorus is undoubted, but, of course, it can be worked. It is stated to average 50 per cent. of metallic iron and sufficient lime to be self fluxing. The population of this place is 3,500 and it has two banks which are prepared to loan on good security for 10 per cent. or more, which is not an unusual rate in the South.

That night found us in Chattanooga, and the next day we went around that city, which has developed since 1880 from 12,000 inhabitants to 30,000 or 40,000 in 1888. Eight railroads run in here, not including the Belt line, which has 50 miles of steel rail laid, and seems to run in about every direction and to every point of the compass. It carries about 2,000 people daily, and on Sundays about 8,000. There are 87 factories on the line of this Belt railroad, and the motive power is a dummy engine to each train.

Chattanooga has increased the capacity of her iron output from 196,000 tons in 1880 to 360,000 in 1886, and in wages paid the increase in the same time has been from $2,750,000 to $8,210,000, and the city is still growing. We closed the Convention at this place, feeling that we had been so cordially received that every citizen of Chattanooga seemed to be our friend.

W.

Freight Classification and the Fourth Section.

The Inter-state Commission has filed a report on the case of J. H. & M. H. Martin against the Southern and Union Pacific roads, which was tried Dec. 16 last. The complaint was that a carload of dried fruits from San Francisco to Denver, Col., in July, 1887, was charged $532.11, when the rate to Missouri River points would have been very much lower, the complainant alleging that the charge to Kansas City and thence back to Denver would be less than the charge from San Francisco to Denver direct. The opinion, by Commissioner Walker, goes very fully into four points: first, the complications of the classifications not only of these roads but of roads all over the country, in making intricate and confused rules concerning mixed carload lots; second, the unwarrantable differences in rates on commodities which are substantially similar in nature and value; third, intermediate rates exceeding rates to terminus and return; and, fourth, the long and short-haul clause of the Inter-state law.

The shipment concerning which the complaint was made

consisted of 6,400 lbs. of dried fruits and 14,525 lbs. of raisins. The classification provided that mixed carload lots of dried fruit might be taken at the carload rate if the various kinds came under the same classification; but raisins were not classed the same as "dried fruits." The opinion quotes the provisions concerning mixed carload lots from the classifications of the Trunk lines, the Southern Railway & Steam Association, and other associations, and continues:

"It is apparent that in every case of a shipment of a mixed carload of goods the shipper must possess and must carefully study the classifications in use throughout the whole route covered by the way bill in order to ascertain what the proper charge should be or whether he has been overcharged in the transaction. A shipment starting under one rule and passing into a territory where a different rule is in force is liable to have the rate increased unless the station agent at the initial point is thoroughly conversant with all the classifications; and, on the other hand, such a shipment is liable to be charged through to the destination upon the less than carload basis, while entitled to considerable reduction under other classifications before the destination is reached.

"The aggregate amount of shipments in mixed carload lots upon all the lines in the country is considerable. The inconsistencies in the treatment of such shipments by different carriers under different classifications, and frequently by the same carrier where different classifications are used for different destinations, have been a source of constant annoyance to the community, and have constituted one of the little things the multiplication of which has tended to create and intensify a feeling of irritation on the part of the public against railroads and their managers. It is excessively annoying for a shipper who has made up a carload lot in the expectation of receiving a carload rate to find that a few more dollars are exacted because the rule in force upon some connecting road prohibits the car load rate in case more than one kind of articles are embraced in the shipment, although no substantial increased expense to the carriers is involved; and it is still more annoying to find that a rate apparently shown by the tariff sheets of the carrier at the shipping point is not sufficient to obtain the delivery of the goods at destination; or, on the other hand, that he might have obtained a lower rate if he had been fully apprised of the diversities prevailing in different sections or in respect to different consignments.

"This whole matter is in a state of elaborate and unjustifiable confusion. It should be taken up at once by the various traffic managers and associations controlling classidcation in different parts of the country, and a common rule immediately established. Such a rule, in order to be satisfactory and just, should be precisely fair as between the shipper and the carrier, easily comprehended in its terms, reasonable in its nature, and applicable throughout every shipment without change."

The carriers of the whole country are interested and would be entitled to be heard, either generally or through their associations, before the Commission could safely make such an order as would meet the case; at the present time, therefore, the Commission only recommends the immediate adoption of some uniform classification rule which shall definitely control the question of mixed car load shipments.

The use of different classifications over the same road for traffic going to different places is severely criticised as a practice which is almost sure to deceive shippers unless they are expert in the study of tariffs, and the classifying of raisins as different from other dried fruits is characterised as unreasonable. Commissioner Walker says: "These irregularities and inconsistencies are not reasonable. In all matters of classification the influence of the Commission will be cast in the direction of clearness and simplicity. Instead of seeking for reasons justifying the existing confusion, persistent efforts should be made to efface it. It is of little consequence how such complications arose. The present question is, what is now reasonable and just in view of the principles established in the act to regulate commerce. Whatever is not so should be corrected as speedily as is practicable."

"In the present case the rating of the same kind of commodities in different classes works an injustice which needs only be stated to be seen. Dried grapes are certainly dried fruit, equally with dried peaches, plums, or apricots; their value, as above shown, is less; and the word 'Raisins' in the Western Classification (very likely in the first instance applied to the shipments west from Chicago of the imported 'Raisins' of Europe), has the effect here to impose a burden which is not supported upon any reason adduced in the proofs, and which the East-bound Classification for through business, deliberately adopted by the same carriers, does not impose."

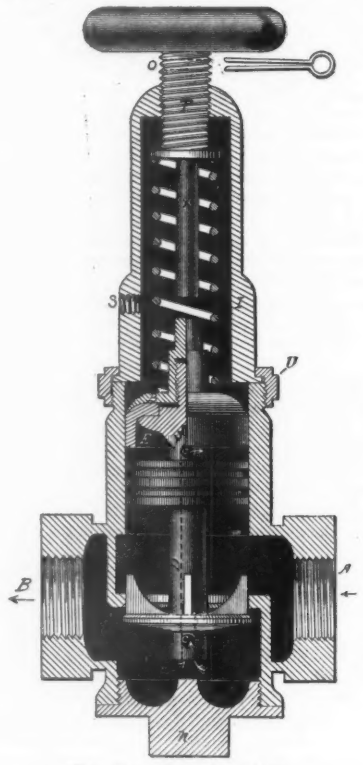
The claim that the rate to Missouri River and back to Denver would be lower than the direct rate "was founded upon a natural conclusion growing out of the application of different classifications to the rates in the tariff sheets," and was not supported by the evidence. This question was taken up by the Commission on its own motion in June, 1887, and in consequence of the investigations then made the railroads corrected the inconsistencies theretofore existing. The Commission, however, "was exceedingly careful to disclaim the expression of any opinion upon the question of whether a greater sum could in any case be properly charged for a shorter distance than for a longer upon the transcontinental lines."

In discussing the Fourth Section Commissioner Walker gives a brief résumé of what has been done under the law on this point since the establishment of the Commission, and explains very fully what the transcontinental lines have done in the matter of rates since the beginning of the rate war in February, 1886, including an account of the advent of the Canadian Pacific in the field, and its action and the effect thereof. The Canadian line took only about 7,000 tons of freight from San Francisco between April 1 and Dec. 31, 1887. Its rate on dried fruit to Chicago was at different times 90 cents and $1. By the tariffs now in force on the Southern and Union Pacific the rates to Denver are in no case higher than those to the Missouri River, except on second class, but the classifications used have such important differences that there are still important exceptions to this rule; and dried fruits in carloads are, in fact, taken to the Missouri River at $1.25, while to Denver the rate is $1.50. The Canadian Pacific agreed with the American lines on uniform through rates on Jan. 16, 1888, and since then rates have been maintained.

In conclusion the report says: "* * The matter is now in a state of crystallization among the carriers themselves. The changes that have been made within the past three months in the way of equalization of tariffs and doing away with the differences that have long been maintained against interior points, are very noteworthy. So long as the carriers are actively engaged in a rearrangement of the tariffs and classifications, and while the changes made are in the direction of conformity to the law, it is better that the details of the matter be not interfered with by the Commission. There are many factors in the situation which are obviously uncertain. The subject must be dealt with as somewhat experimental. * * * Believing that an effort is being made in good faith to readjust the local tariffs of the transcontinental lines, and to simplify and combine the classifications in use upon through and local business in accordance with the requirements of the law and the views of the Commission, it is considered best to leave the matter for the present in the hands of the carriers, and allow an opportunity for them to completed the work in which they are engaged. No order, therefore, will be entered in this case for a period of sixty days from this date (May 17) and further proceedings are for the present suspended."

The Ross Reducing Valve.

The accompanying illustration represents a steam reducing valve, especially designed to be used in connection with



The Ross Reducing Valve.

steam heating. The construction of the valve is so clearly shown in the engraving that any further description appears unnecessary.

Washing Rails to Increase Adhesion.

At the Milan session of the International Railroad Congress last September the subject of the use of a jet of water or steam for the increase of adhesion between the driving wheels and the rails was somewhat discussed. The principal contribution to the discussion was made by M. Silvola, chief of the motive power department of the Mediterranean system of the Italian railroads. The discussion is summed up in a recent issue of the *Bulletin* of the Commission as follows:

The use of water on the rails in front of driving wheels in order to increase adhesion has been tried on several railroads, but nowhere with so much care and persistence and with such measure of success as upon the Mediterranean system and on the Gothard Railroad, at certain places where steep grades in tunnels seemed especially to call for its use. The use of sand has serious drawbacks. Its preparation requires plant, involving considerable expense. It must be screened, dried, stored, and finally carried in boxes on the locomotives, which are not only unsightly but frequently inconvenient and more or less obstruct the view. Throughout a line of railroad storehouses must be established, and it sometimes happens that the sand store is not found when it is most wanted. The use of sand increases the resistance of the wheels of the train; may be more or less injurious to the machinery, and is destructive to rails, especially in tunnels. It seems evident, therefore, that the use of water, which is accompanied by none of these drawbacks, will be preferable to that of sand, provided that it is effective and economical, which the experiments seem to have proved. The chief objection to its use is the consumption of the water carried in the tender, which has often been found to amount to from 12 to 20 gallons per mile. Moreover, the water must be heated– that is to say, when applied to the rail it must have a temperature of about 150 degrees F., not only to prevent its freezing, but to dissolve the grease accumulated on the rails. This involves a certain consumption of steam. In spite of this expenditure of steam, the injector which has been used by the Mediterranean company has made this system entirely practicable, whereas the use of water direct from the boiler has not been so successful. The use of water has been found by the Mediterranean company to be so economical, as compared with sand, and the company is so thoroughly convinced of the superiority of this practice, that it has been definitively adopted as the standard. It is suggested, moreover, that it will be found quite possible to use exhaust steam rather than live steam for heating the water as it passes to the rails. In summing up, it was considered as the result of the discussion that, taking into account the well-known objections to the use of sand and the favorable results of the experiments reported, it was highly desirable to continue and to extend the trials of this method, which has succeeded so well in special cases.

A Canadian on Railroad Commissions.

The desirability of a railroad commission for Canada was the subject of a paper recently read before the Canadian Society of Civil Engineers, by A. T. Drummond, C. E. Railroads in Canada are now supervised by a committee of the Privy Council, and the object of Mr. Drummond's paper seems to be to show the necessity of a board selected with more especial reference to fitness for dealing with railroad questions. He takes for his text a comparison of the statistics of accidents in the United States and in Canada, though, as might be expected, he is unable to make any accurate deductions from the records, on account of their well-known imperfections, and in the discussion which followed the reading of the paper the claim that Canadian railroad travel is more dangerous than on roads of the United States was challenged, though we do not gather from the reading of the paper that Mr. Drummond made such a claim.

The larger part of Mr. Drummond's paper is taken up with a systematic statement of the subjects which should engage the attention of a railroad commission. All the most important branches are stated in detail, together with brief references to the facts of experience, chiefly in the United States, which go to show the necessity of state supervision. Mr. Drummond shows a very intimate acquaintance with the best American practice in the various mechanical lines. He begins with guard-rails, advocating them on all bridges, and detailing the merits of the Latimer rerailing device very clearly. He also advocates guard timbers on "all embankments exceeding a certain height," but what that height should be he does not say. The necessity of bridge inspection is clearly pointed out and the methods of the New York State Commissioners commended as better than those of any other state. The safe height for overhead bridges is discussed and reference made to action taken in Ohio and Connecticut. Power brakes and automatic couplers on freight cars, and railings on freight car roofs, are intelligently discussed in the light of the latest results of practice and experiment in the United States. In speaking of passenger cars, the importance of having axes, pails and other tools on each car, of testing wheels every 60 miles, and of providing air brakes for every car in a passenger train is shown. Electric light is claimed to be the only safe light for cars in passenger trains. Continuous steam heating is advocated at length, and safety appliances for upper berths in sleeping cars are touched upon. The St. Thomas disaster of last summer is used as an argument for compelling railroads to furnish seating accomodations for all passengers. The laws of Massachusetts concerning locomotive boilers and safety valves, and their inspection, are referred to as necessary in all countries. Foot-guards to protect trainmen's feet from danger from frogs are recommended. The necessity of substituting overhead bridges or subways for highway grade crossings is shown, and the rigid requirement of gates, where this change is impossible, is advocated. Interlocking signals at railroad grade crosings are mentioned, and the necessity of making and enforcing stringent laws against walking on the track is recommended. The securing of employés against overwork, and their punishment for intemperance, as well as prohibiting the sale or use of liquors on railroad premises, are mentioned as auxiliary means of securing freedom from accidents. Although the committee of the Privy Council has considerable authority, the fact that the members are not specially selected as railroad experts and that they have numerous other duties, has worked to deter people from applying to it for redress of grievances even where such application would have been an effective remedy.

Mr. Drummond, in conclusion, sums up the duties of a railroad commission as follows:

(1) To consider every application for a railroad charter and report to Parliament on the necessity for the same and on the *bona fides* of the applicants and on their ability to construct the railroad. (2) To promote the health and comfort of passengers, as in ventilation and other sanitary essentials in cars and station buildings. (3) To secure safety for passengers and employés by regular inspections, by examining into the causes of accidents, and by investigating and, if necessary, directing the adoption of improvements, which would tend to insure safety. (4) To prevent excessive or unreasonable discriminating rates, and to see that railroads afford reasonable facilities to the public for traffic, as in station buildings, and in the location of such buildings and of the tracks. (5) To regulate questions between municipalities and the railroads, as in matters of taxation and level crossings. (6) To determine differences between different railroads, as in railroad crossings, interchange of freight and, possibly, competition in rates. (7) To obtain accurate and full statistics of the construction, equipment and results of operating of each railroad.

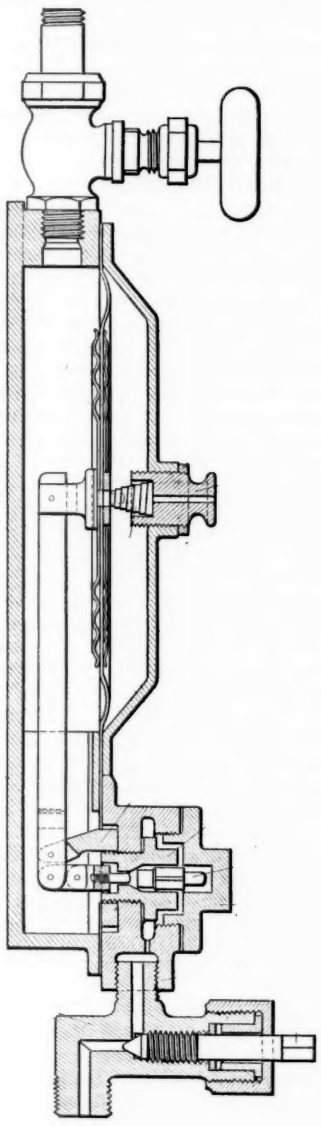
The Foster Governor and Lamp.

One of the chief obstacles to the introduction of gas for lighting cars is found in the necessity for carrying gas enough for a considerable period of continuous running. This involves high pressures and efficient lamps; and high pressures can only be attained and used by good compressors, and reducing valves or governors that will work satisfactorily at upwards of 10 atmospheres.

A new company, the Foster Lighting Co., has recently put upon the market some new and improved devices, which, used together, make it possible, it is claimed, to light a car for a much longer period than has been done in the past. They have compressors in use in a number of places, which work easily up to a pressure of 800 pounds, thus making it possible to carry 2,000 or 3,000 ft. of gas in comparatively small cylinders under the car. Their high

pressure governor works readily at this pressure and lower, and they have recently brought out a new form of regenerative lamp, with an inverted burner, somewhat similar to those coming into use in stores and large offices.

The accompanying cut is a section of the Foster governor, and needs little explanation. The gas under high pressure enters at the bottom through a passage controlled by a needle valve, thence it goes, still under pressure, to the compensating valve, shown just above. This latter is so arranged that the gas pressure tends to close it, while a lever connected with a diaphragm, in the low pressure chamber beyond, acts to keep it open. As long as the pressure is below the desired point in the latter chamber, the lever keeps the valve slightly open. As soon as enough gas has passed through to bring the pressure to the point for which the governor is set, the diaphragm is forced to the right, compressing the spring which works against it and permitting the pressure to close the compensating valve. The low pressure chamber is directly connected to the burners by ordinary piping, and as soon as they use enough gas to reduce the pressure, the spring forces the diaphragm to the left again, and thus opens the controlling valve for another supply of gas.



The Foster Governor.

It is claimed that in practice the action is so rapid and delicate that the compensating valve is always kept slightly open, and the pressure in the low pressure chamber remains almost absolutely constant, at any desired point, no matter whether the high pressure be 10 pounds or 500, or whether the gas is being used by a single burner, or by all of the lamps in the car.

The lamp is so arranged that its waste heat raises the temperature of the incoming gas and air to a very high degree, and as a result the flame secured is exceedingly brilliant, and gives an illumination fully equal, it is said, to that from four common burners, each using the same amount of gas.

The Strong Locomotive.

The distribution of steam in the Strong locomotive was the subject of a paper read by F. W. Dean, of Taunton, Mass., at the Nashville meeting of the American Society of Mechanical Engineers. Mr. Dean's paper was illustrated by numerous drawings of valve gear and indicator diagrams, some of which have already appeared in the *Railroad Gazette*. Mr. Dean used some of the figures collected by Mr. J. S. Coon during his trial of the engine last year, referred to in our columns at the time. Seven locomotives were considered, one being the regular Strong engine, known as No. 444; another, No. 383, fitted with an ordinary boiler and the Strong valve gear and cylinders; No. 357, having an ordinary anthracite-burning boiler, Stephenson link motion and D valves, with De Lancey's balancing device; two others were similar to No. 357; still another was a bituminous coal burner, with ordinary boiler, Stephenson link motion and D valves, and, finally, an English locomotive, with bituminous coal burning boiler, Stephenson gear and D valves. The following figures for actual consumption of water per indicated horse-power per hour were given: No. 357, 26.021 lbs.; No. 383, 23.25 lbs.; No. 444, 27.01 lbs. The average actual water consumption of No. 444 was thus more than that of No. 357. This is inconsistent with the consumption of steam as deduced from the diagrams from the indicator, and is, therefore, to be credited to the boiler and the personal equations of the men in charge.

Notwithstanding that the boiler was obliged to evaporate so much water, it did it with an average evaporation of 7.41 lbs. of water per pound of coal, while the boiler of No. 357, which was a 54-in. wagon top boiler, evaporated on the average 6 lbs. per pound of coal, or the evaporation of No. 357 was only 81 per cent. of that of No. 444. The average evaporation of No. 383, which has a 55-in. straight top boiler, was 5.52 lbs. of water per pound of coal, or only 74½ per cent. of that of No. 444. These comparisons show the great efficiency of the Strong boiler over the common type. The efficiency of the Strong boiler, while the water consumption was very high, brought the coal consumption down to an average of 3.64 pounds per indicated horse-power per hour, while those of Nos. 357 and 383 were respectively 4.33 and 4.24. That is to say, whether working upon water or steam, 444 used 84 per cent. of the coal required by 357 in developing one horse-power and 86 per cent. of that required by 383. This shows the economy of No. 383 to be due to the valve gear and that of No. 444 to the boiler. The true test of the gear is found in the results from the cards, which are independent of the boiler performances These results show the consumption of dry saturated steam by No. 383 to be 81⅘ per cent. of that of No. 357, and the consumption of steam by No. 444 to be 95 per cent. of that of No 357. There is no apparent reason why No. 444 should not equal No. 383, because the cylinders and valve-gears of the engines are identical, except that No. 444's cylinder is 1 in. larger in diameter than No. 383's.

In discussing this paper, Mr. Barrus thought Mr. Dean inclined to overestimate the advantages of a four-valve engine as compared with the Stephenson link motion. He referred to the diagrams taken from the Strong locomotive, and to those taken by him (Mr. Barrus) from 129. Neither set of diagrams corresponded very closely to the ideal perfect diagram. In both instances there was wire-drawing before cut-off, early release, early compression and high back-pressure. Except in the matter of wire-drawing the Strong diagram came nearest the ideal. Taking the whole together, the diagrams from the Boston and Albany engine have the more pleasing effect on the eye. The comparison, however, did not amount to much. The comparisons were not fair, in which Mr. Dean had shown the area of diagrams from the Strong locomotive to exceed the area of diagrams from the Boston & Albany locomotive, because the point of cut-off on the Boston & Albany engine was much the shorter. Had the cut-off been equal the areas would have been substantially the same. Mr. Barrus then made comparisons of a diagram from each engine, in which the cut-off was substantially equal, and said the Boston & Albany diagram showed the highest mean effective pressure. In one of Mr. Dean's tables, the steam, by indicator, was given at release as 21.3 lbs. per indicated horse-power per hour. This was with steam pressure of 170 lbs., and a mean effective pressure of 58.9 lbs. On the Boston & Albany locomotive, steam pressure 156 lbs. and mean effective pressure 54.4 lbs., the steam at release, per indicator, was 20.3 lbs. As figured from the diagram, the Boston & Albany locomotive, with the Stephenson link motion, was the most economical. There appeared to be some inconsistency in the figures given by Mr. Dean. In one of his tables the feed-water was given as 21.3 lbs. per horse-power, and the water consumption figured from the diagram with about the same indicated horse-power is the same, viz., 21.3 lbs. Taking the average results shown by all the tests, the water consumption was 23.25 lbs. per indicated horse-power per hour, and the average of all the quantities giving steam accounted for by the indicator was 22.05 lbs. We have here a ratio of steam accounted for to actual consumption of .95. It seems from this that the loss from cylinder condensation and leakage measured in the Strong locomotive at release was only 5 per cent. This was an unheard-of performance in an engine cutting off at about one-quarter stroke. The steam accounted for at release in the Boston & Albany engine was .79 of the actual consumption, this being at a cut-off of about one-third. This corresponds to authentic result obtained from automatic cut-off engines, but .95 is altogether out of the question. The actual consumption of coal of engine 383, with the Strong valve gear as given by Mr. Dean was an average of 4.24 lbs. per indicated horse-power per hour, and that of the Boston & Albany engine was 3.92 lbs. The comparison as to economy of the two types of engines, even here, appeared to favor the old-fashioned engine. The comparison was not exact, because one engine used anthracite and the other bituminous coal. It was, however, suggestive. Referring to Mr. Dean's statement, that all balancing devices for valves leaked, Mr. Barrus said that the valves on the Boston & Albany engine were balanced by a very simple device, and that these valves did not permit a breath of steam to pass them when placed at midstroke and subjected to full boiler pressure.

Mr. Coon said the true test should be the water used; probably in the test Mr. Barrus made, a superior quality of coal was used.

Mr. Barrus called attention to the statement appearing in the paper of Mr. Dean, as follows: "The great water consumption of No. 444 (one of the locomotives fitted with the Strong valve gear) was due to excessive blowing off, and to priming, caused by a timid engineer carrying the water too high." This statement, he said, was remarkable when, as by Mr. Dean's tables, presented in the paper, within three per cent. of all the water supplied to the boiler was accounted for by the indicator.

Mr. Coon reminded Mr. Barrus that the figures he gave were his (Mr. Barrus') and not Mr. Coon's, to which Mr. Barrus retorted that he took his figures directly from the paper presented.

President See asked if the engine on the Lehigh Valley road, against which the Strong locomotive was tested, was known to be in good condition as to tightness and adjustment of valves. This he said was very important.

Mr. Coon replied that the master mechanic was requested to give them as good an engine as he had for the test. He thought the engine had been out of the shop about two months. It was not examined with a view to seeing if the valves were tight, and in proper adjustment.

TECHNICAL.

Hadfield's Manganese Steel.

Mr. Daniel Adamson, the President of the Iron and Steel Institute of Great Britain, gave the following interesting particulars of this metal in his presidential address at the recent annual meeting:

Steel containing 2.5 to 7.5 per cent. of manganese may be said to be as brittle as glass, breaking under a transverse load with much less force than cast-iron. A cast-iron ingot, 2⅝ in. square, 2 ft. between supports, broke with a force of 3¾ tons, while a cast-iron bar carried 12 tons; but when manganese was further increased up to 17 and 20 per cent. the same size of steel bar, under similar conditions carried 29½ tons to 38 tons, or about eight to ten times as much as the metal low in manganese. This increase in transverse strength is not the only noticeable property of high manganiferous metal, as when tested with from 12 to 14 per cent. of manganese, high carrying power is secured with great elongation. A bar 0.755 in. diameter, having an area of 0.447 sq. in., with the following composition:

	Per cent.
Carbon	0.85
Silicon	0.23
Sulphur	0.08
Phosphorus	0.09
Manganese	13.75

carried a load of 57.02 tons per sq. in., and took permanent set at 29½ tons, with an elongation of 39.8 per cent., showing a power of endurance with great toughness, unequaled by any class of metal called steel. This metal is toughened by heating it up to a high temperature or white heat, then plunged into water having a temperature of 72° Fahr.

Presuming that further investigations should fully corroborate the leading properties set forth, a further development will take place in the economical manufacture of such articles, in cases where castings in steel are more especially applicable, and where great strength and dependence are required. Notwithstanding the excellent properties of strength and ductility, as illustrated by the high carrying power and great elongation, manganese steel would appear to be a metal very difficult to machine, which would militate much against its practical application for many purposes, unless this rapid cooling in water or other liquids, while developing strength and toughness, should at the same time produce a general softening tendency, calculated to make it more easy of manufacturing manipulation.

Compressed Oil Gas.

At a recent meeting of the Institution of Civil Engineers a paper was read on "Compressed Oil Gas and its Applications," by Mr. Arthur Ayres, M. Inst. C. E.

Faraday, in 1825, contributed a paper to the Royal Society "On New Compounds of Carbon and Hydrogen, and on Certain Other Products obtained during the Decomposition of Oil by Heat." That communication dealt with the chemistry of oil gas, and stated that one gallon of hydrocarbon gas yielded nearly 1,000 cu. ft. of good gas.

The gas obtained from the hydrocarbon was manufactured by the Portable Gas Co., and was compressed to 30 atmospheres. It was drawn from a gas holder, and passed over water into a large and strong receiver, and from it into portable vessels, the principal condensation taking place in the receiver. The oil gas manufactured by the Portable Gas Co. was not distilled from shale oil or petroleum, but from other oils and fatty substances, mineral or vegetable. Between the years 1792 and 1883, numerous ingenious patents were taken out for manufacturing and compressing oil gas for lighting and heating purposes. Oil or hydrocarbon gas was the product of heavy petroleum or shale oil once distilled. It had a specific gravity of about 0.840, and flashed at about 220° Fah.

The illuminating intensity of oil gas varies from 40 to 50 candles when burned in a London standard Argand burner, with a consumption of 5 cubic feet per hour, under a pressure of 0.5 in. of water. The price varied from about $1.50 to $4 per 1,000 cubic feet, being directly influenced by the quantity of gas produced, the management of the retorts and the price of oil, fuel and wages.

Compressed oil gas was first used for lighting railway cars in 1871, in Germany, on the Lower Silesian Railway. The results were very satisfactory and the system was largely used in Germany and was introduced in England in 1878, on on the St. John's Wood trains of the Metropolitan (Underground), with equally satisfactory results. The Great Eastern Railway Company was the next to adopt it, the Metropolitan Railway Company definitely adopted it for the whole of its rolling stock a few weeks later, and other companies quickly followed suit. The systems chosen were those of Pintsch and Pope, which differed but little from each other. Some trials were also made of Bower's system on the Great Northern. The gas holder was attached either to the roofs or to the under-framing of the cars, and was charged to a pressure of from 6 to 8 atmospheres. The gas was conveyed to the roof lamps by pipes from the gas holders, passing through a contrivance for regulating the pressure at the burners, one such regulator being attached to each carriage. There were now 23,499 cars so illuminated on Pintsch's system, and 2,791 on Pope's system. Taking the double journey between Euston and Aberdeen, the cost of compressed oil gas was 0.08 cent. per lamp per hour, and for the ordinary oil system, 0.77 cent. per lamp per hour, showing a greater cost of the ordinary oil system of 0.69 cent. per lamp per hour, or 8½ times more than oil gas.

Locomotive for Suburban Traffic.

The Rhode Island Locomotive Works have recently completed a double ender of the Forney type for running hourly suburban trains on the Providence & Worcester division of the New York, Providence & Boston. The principal dimensions are as follows:

Cylinders	16 by 20 in.
Drivers, diameter	56 in.
Driving and total wheel base	6 ft. 6 in. and 22 ft. 4 in.
Boiler, dia. barrel	50 in.
Flues, No.	157
Pressure, lbs. per sq. in.	140
Grate, rocking	54 by 35 in.
Weight on drivers	63,700 lbs.
" total, in working order	98,500 lbs.
Capacity, 2 tons coal, 1,700 gallons water.	

The engine is designed for burning soft coal, and has a brick arch, extension smoke-box and straight chimney, 13 in. inside diameter.

Drainage of the Valley of Mexico.

The contract for the completion of the Tequixqueac tunnel, which is to drain Lake Texcuco, and through it the city and valley of Mexico, has been signed by Mr. J. Gladwyn Jebb, representing the London-Mexican Prospecting Company, Limited, and by the representatives of the Board of Drainage Commissioners.

The total length of the tunnel is to be about 6 miles (9,520 metres), of which about 10 per cent. is now excavated, and is to be lined with brick throughout. The contract price is $2,350,000, which is to be raised by issuing city 7 per cent. bonds at 82½. The material is "tepetate," indurated volcanic ashes, which works readily with the pick.

The time for completion is 2½ years, with a premium of $300 for each day saved, and a penalty of the same sum for each day exceeded.

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions. machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Many arguments and much mathematics (?) have been expended upon the M. C. B. coupler lines in efforts to prove that the lines are unfitted for their purpose, and that they are not covered by the Janney patents. Unfortunately for the mathematician, the Executive Committee of the Master Car-Builders' Association did not attempt to solve the question by a liberal use of misapplied sines and cosines, but tested actual cars round a sharp curve in Pittsburgh. The lines were taken from the particular Janney coupler that in the opinion of the sub-committee acted most perfectly in passing round this curve. In drawing the lines, odd dimensions involving small fractions of an inch were modified so that only even figures appear in the standard lines. This method was doubtless very unscientific, but it had the merit of being practical and more exact than the so-called mathematics, which give the maximum angle formed by the centre lines of adjoining cars at 16° 30′ instead of 14°, the correct figure as given in these columns.

The Secretary of the New York Railroad Club stated at the last meeting of that body that his company, the Union Tank line, would adopt any coupler adopted by the railroads. This common sense announcement was followed by a suggestion that as the vertical plane type of coupler appeared to be generally preferred, it would be well if inventors of link couplers would recognize the fact and devote their attention to other matters and cease wasting their time and energies in fighting against the inevitable. It is to be hoped that Mr. Smith's excellent advice will be generally followed.

It was announced that the subject of vertical plane and link and pin couplers would be discussed at the recent meeting of the New York Railroad Club. Owing, however, to the almost entire absence of railroad men, the proceedings hardly partook of the nature of a discussion. The patentees and representatives of various couplers had to content themselves with explaining the merits of their several devices to their fellow inventors. The monotony of the proceedings was broken only by Mr. Perry, who read a long paper containing a curiously assorted jumble of figures apparently showing that the shock at the Burlington brake trials was solely due to the employment of vertical plane couplers, and that link and pin never, never, well, hardly ever, produced any shock worth mentioning. Mr. Perry stated repeatedly and correctly that the Westinghouse train fitted with the Janney coupler moved the slidometer 103 in. at the Burlington brake trials in 1887, but he carefully avoided all reference to the essential facts, that the shock was then abolished by the simultaneous application obtained by electricity, and that since that date, a few simple alterations in the dimensions of the pipes and air passages in the brake have entirely prevented shock, though the coupler remains unaltered. The argument that can only be made plausible by the omission of material facts is confessedly weak, and the absurdity of attempting to prove that the shocks at Burlington were caused by vertical plane couplers is too transparent to deceive a child of ordinary intelligence.

It has also been contended that the traction required to start and move a train with tight or vertical plane couplers is in excess of that required with link couplers. Repeated experiments have exploded this idea, and have shown conclusively that a heavier train can be started with tight than with slack couplings. The assertion that a heavy train cannot be started without the assistance of slack has been clearly disproved, and there is no reason to suppose that the resistance in running is increased by the use of tight couplings. The main element of resistance at any speed usual with freight trains is evidently the friction of journals, and, as far as we are aware, there is no evidence that flange friction, on curves as generally used on railroads, is appreciably increased by the use of tight couplings.

The vertical plane couplers at present in the market all permit free, independent vertical movement to adjoining vehicles, and the great majority permit adjoining cars to pass freely round curves considerably sharper than those used on most railroads. In fact, the independent motion of the cars is only limited in two directions. When coupled the cars have little independent to and fro motion, owing to the small amount of "slack." No one supposes that this elimination of free slack increases the resistance of the train. The only remaining motion is lateral or at right angles to the track. It is difficult to see why any limit placed upon the manner in which cars sway from side to side should increase the resistance and both from experience and analogy such a simple means of maintaining cars in line would appear to be attended with the minimum of friction. Any side oscillation of cars must produce flange friction, and it would appear that a vertical plane coupler by checking sidelong motion would certainly diminish rather than increase the resistance of a train.

The drawbridge accident described in another column of this issue undoubtedly occurred in consequence of the bridge not being accurately closed. While the draw-tender is presumably a careful man, having been in the position a lifetime, there seems little doubt that he was mistaken in asserting that the rails were properly matched. The joint being accurately fitted, the lifted rail would, if out of place by only a very small distance, rest on the fixed rail at the extreme end of the latter. This would bring the upper side of the end of the former some 4¼ or 5 in. above the lowest point of an approaching wheel, so that it is not strange that the rail was crowded outwards. After all the experience with drawbridge dangers for the past 50 years and the costly provisions adopted for safety in crossing them, it seems a pity that a crowded passenger road should have been left with nothing but the vigilance of one man to protect it from disaster. This bridge tender had to look carefully at these rails every time he closed the bridge, and if he never in the darkness of night or from distracted attention made a mistake in his conclusion and consequent action, it would be much more wonderful than if he *did* make such a mistake. The simple device of a locking bar, interlocked with the signals, is so easily applied that there is no excuse for not having it. Clearly, if the mitred joint to relieve vehicles from jolting is worth having, it should be made safe. It seems quite clear that the driving wheels of the engine ran on the sleepers the length of the draw and then were re-railed, and the Bush interlocking bolts are credited with holding the rails firmly enough to allow of this. The track curves slightly to the left on the trestle, but the wheel marks on the sleepers indicate that the vehicles followed the curve, and without touching the rails. Every time a pair of wheels dropped between the sleepers its axle, if inclined to swerve, must have been brought back to an exact transverse position.

Our accident record for January and February, 1888, contains four locomotive boiler explosions. The record of boiler explosions in the *Locomotive*, a journal published by the Hartford Steam Boiler Inspection and Insurance Co., states that six locomotives blew up during these months. In each record an explosion of a water tube in the grate of an anthracite burning engine is given as a boiler explosion. The record in these columns therefore makes it appear that locomotive boilers explode at the rate of 18 per annum, which agrees fairly well with the average given in our columns for several years past. Our contemporary's record, however, shows that they occur at the rate of 30 per annum. Such a discrepancy is tolerably good evidence that the number of boiler explosions considerably exceeds the largest figures given above, and that many explosions are never made public. This uncertainty as to the actual number of explosions is not only a direct encouragement to bad boiler making and neglect in the maintenance and testing of boilers, but it effectually prevents any progress in the direction of safety. Boiler explosions may, for aught we know to the contrary, have increased in frequency, showing that greater care is needed, and that the increased thickness of plates and the greater frequency of power riveting, double riveted seams and other improvements in recent boiler construction have not kept pace with the increase of pressure. Unfortunately not only is it impossible to obtain even an approximate idea of the number of boiler explosions, but we are left in almost absolute ignorance as to the causes which led to the explosion. Only in rare cases can any information be obtained on such simple and vital points as the age of the boiler, the location of the initial point of rupture, whether the pressure was above or below the intended working pressure, whether the cause could have been detected by proper periodical internal examination, and whether it was primarily caused by bad design or workmanship, bad quality of material or of water, or by excessive pressure, permitted either by defective safety valves or pressure gauges or recklessness on the part of the runner or fireman.

Trustworthy information of this nature collected by a competent body acting under the authority of the United States government would be of great value especially to small roads, and would warn many master mechanics of the dangers which should be especially guarded against. Boiler explosions are now surrounded by a veil of mystery, which may, to a certain extent, serve to shield some persons from a just responsibility, but effectually prevents any useful lesson being learnt by the great majority of those in charge of the construction and maintenance of locomotive boilers. Periodical internal inspection and hydraulic tests will, in combination with good design and workmanship, almost entirely prevent boiler explosions. It is, however, too often taken for granted that boiler explosions are inevitable and can not be guarded against. A full statement of the circumstances under which each locomotive boiler explosion occurred, would, however, show very clearly that the causes are nearly always preventable and that the final rupture could have been prevented had proper precautions been taken.

That the colonial authorities of New South Wales should come to the United States for locomotives does not surprise us, but it is hard for some of the English journals to recognize that there are good mechanical and commercial reasons for it. *Engineering*, in the latest issue received, states that it is probable that a substantial order for locomotives will be placed with American manufacturers "under the plea of pressure of time." It appears that the present Minister for Public Works caused to be introduced into the colonial service in 1879 two types of American-built locomotives which he regards as answering "more satisfactorily than any other the requirements of our [the Colonial] traffic." These were, the Mogul for express passenger service, and the Consolidation for freight. On taking office a second time, not long ago, he found that various changes had been made in the locomotives of the department, and, wishing to retain the two types originally chosen, he caused to be sent to the Baldwin Locomotive Works a letter asking prices for both classes, the Mogul and the Consolidation.

According to the Sidney *Evening News*, "a strong recommendation was given by the firm not to call for any engines of the Consolidation class, as manufactured at the time when this colony ordered those now running, because so many improvements had been made that they had ceased manufacturing this kind of engine in favor of an improved one."

Engineering is very severe on the minister, and the "would-be engineer" who advised him, for introducing originally, and now recommending for further orders, a locomotive already "pronounced by the makers not only obsolete, but wholly unfit for repetition." In fact, our contemporary calls this recommendation of the Baldwins "a Nemesis," unexpected but "richly deserved." We fear that the desire to construct a cheap and prompt "Nemesis" has led a journal usually fair and accurate into statements that are not merely misleading but actually untrue. We believe, and have excellent reasons for believing, that it is not correct to say that the makers pronounced the Con-

solidation locomotive as made ten years ago obsolete or unfit for repetition, but that they did advise the Commissioner of New South Wales to allow the Consolidations, if ordered, to be built on present designs. These include larger boilers, wider fire-boxes and other improvements in detail; but it is misleading, to say the least, to insinuate that they involve a departure from or abandonment of the type. On the contrary, the Consolidation type has grown steadily in favor in the United States and its adoption has been uniformly urged by the Baldwin Works. It would be unfair to English as well as to American builders to say that they have made no valuable modifications in the details of various classes of locomotives in the last ten years, and it is hardly to be charged up against any locomotive that it has been found worth improving. As the makers concerned in this case have built upwards of 1,000 Consolidations since their last order from New South Wales, it is not surprising that they should have improvements to suggest. On the other hand, it is not precisely apparent how an officer is to be blamed for recommending now, for further use, a type of locomotive which he chose 10 years ago, even if meanwhile it has been improved. Ordinarily it would be some evidence of his original sagacity in knowing a good thing when he saw it. On the whole, the more that Nemesis is examined the more of a humbug she seems to be.

In another column will be found a letter from J. W. T., setting forth the alleged dangers of train lighting by gas. We print the letter merely because it sums up in a convenient form some of the misapprehensions of the conditions of gas-lighting, and not because it has the slightest technical value. The alleged dangers, it will be noticed, rest on pure assumption, and we doubt if a single authenticated case can be found in which a car took fire from the gas, and feel still more sure that no passenger was ever asphyxiated by it. Indeed, it may be a question if the air of a sleeping-car would not sometimes be improved by the introduction of a little illuminating gas. The statement that most accidents in which fatalities have resulted from fire have taken place at night, has no bearing on the subject, because (1) accidents are more likely to happen at night, and (2) there is hardly a known case in which a gas-lighted car has been burned. The only case that we think of was at Kouts, where careful investigation showed that the gas had nothing to do with the fire. In fact, instead of being a dangerous method of lighting, we should say that gas is probably the safest now used, hardly excepting candles, which are obviously out of competition. With the usual arrangements, to introduce into a car sufficient gas to make an explosive mixture is almost a mechanical impossibility, and to do so in a short time is quite impossible. The gas is carried in an outside reservoir, and the only pipe in the car is one of ¼ in. diameter in the saloon. If the reservoir is fully charged, under high pressure, and the entire contents of it introduced at once into a tight car, the resulting mixture might be explosive in one system. In another, carrying less gas, it would not be. But in fact in either system it would take hours to pass all the gas from the reservoir into the car. The gas in the reservoir itself cannot explode, as a large percentage of oxygen must be mixed with it to make an explosive compound. J. W. T. draws an alarming picture of the gas from a broken pipe being ignited and blown, under "immense pressure," through the wreck. But it is extremely difficult to ignite gas under heavy pressure, and it would probably be set on fire only at considerable distance from the orifice from which it was escaping. If the regulator is outside of the car, as is the practice in the system most used, gas under pressure would not be delivered in a in a car, but would be quickly diffused in the external air. If the pipe in a saloon chanced to be broken, and the gas escaping from it under a pressure of about one ounce per square inch chanced to come in contact with fire, it would ignite; but it is apparent that many circumstances must conspire for any harm to arise from the gas. The deductions made here from the physical conditions are entirely confirmed by the experience of a number of years with thousands of gas-lighted cars. In no case, we believe, has investigation shown that serious harm has come from the explosion or burning of the gas.

In our last week's issue we made some allusion to the public interests involved in low export rates. In reading the English railway bill, as reported back from the Lords to the Commons, we see that its framers take these facts into account, even in the much more difficult question of import rates. No difference is to be made in the treatment of British and foreign merchandise under similar conditions of transport; but the Commissioners, in deciding whether the conditions are similar—which is, of course, the critical point in the whole matter—may consider whether difference of treatment "is necessary for securing, *in the interests of the public*, the traffic in respect of which it is made." We commend this way of looking at the matter to the attention of the Inter-state Commerce Commission. It is not exactly a question how they shall interpret a particular clause, but how far they shall extend their jurisdiction to a set of cases lying barely within its sphere. In deciding matters like this, questions of public interest should be an all powerful consideration with them.

Chicago can now join New York in decrying the railroads for "discriminating against the city's interests," as the Northwestern roads seem to have agreed, after their few weeks' hesitancy, on a tariff by which they will accept lower rates on shipments bound to or from the seaboard than on those originating in Chicago. They are simply following the stern law of self-preservation. If St. Paul wishes to buy its goods in New York, and can get them delivered promptly for a dollar by the way of Sault Ste. Marie, there is nothing but folly in charging $1.25 via Chicago. A dividing line cannot be maintained at Chicago any more than at a way station in the woods 100 miles west of Sault Ste. Marie, unless it is justified by some *service* which Chicago men perform. Chicago has also claimed that grain from Iowa must pay toll at its gate, but the action of the roads during the past year in making reduced through rates from the Missouri River to Liverpool has shown that a train of corn cars can change engines in the wilds of Indiana as well as in Chicago. There need be no fear but that competition will keep the rates to and from Chicago low enough to freely move all the grain or dry goods or any other kind of goods that Chicago can handle to the advantage of either the producer or consumer. And if the passage of goods through Chicago is not of advantage to one or the other of these parties, why should the freight go through that city? The Northwestern roads seem to have sensibly concluded that peace can be arranged just as well *before* they have completely bled each other as *after* that event.

Allegations of rate-cutting on the part of various roads in the Trunk line and Central Traffic associations continue to be made, but there seems to be no way of discovering just how much of it is being done. It is asserted that underbilling continues in spite of the inspection bureaus, perhaps as a final exhibition of intensified "cussedness" before the advent of the expected new law. Beyond this there are no specific charges except that lighterage, cartage, loading, etc., are paid for by the roads at exorbitant rates. It would seem in the nature of things that this last-named practice could not be very common, though the Inter-state Commerce Commission's recent investigation showed that railroads will allow the disposal of very large sums of money to go at loose ends and wholly uncared for. Paying for cartage and loading is even more unfair as between competing shippers than underbilling, for the reason that many of them do not do their own carting and loading. If such payments are entered as advanced charges on the waybill and collected from the consignee, they cannot be reduced before collection without jugglery in the accounts. If they are accounted for as "expenses of conducting transportation" the practice is discrimination precisely the same as if it were an undisguised rebate. Seventy-five cents per 100 lbs. from a New York freight station to Chicago is not the same as 75c. per 100 lbs. from a New York store to Chicago. If a road practices such guerilla methods as this it ought not to be difficult to detect it, at least sufficiently to expose the motives of its officers.

In the case of John H. Martin *vs.* Southern Pacific, Central Pacific, and Union Pacific, the Inter-state Commerce Commission has at last decided that the railroads are not warranted in making the rates to Denver permanently higher than those to Kansas City. In other words, the traffic from the Pacific Coast to Kansas City and Omaha, does not come within the scope of the exceptions to the action of the long and short haul clause. The state of affairs contemplated in the Louisville & Nashville decision does not exist here. The long-distance rates to Missouri River points are not now subject to "actual competition of controlling force in respect to traffic important in amount." The Canadian Pacific has made a rate agreement by which it has withdrawn from such competition, and the American through rates have been abandoned. The Commission makes no order in the premises, but implies that such an order will be made unless the tariffs are rearranged in conformity with this decision within sixty days.

We do not propose to criticise this decision in detail. It is very possible that Denver rates may have been kept unduly high, and it is desirable for all parties that they should be lowered. But we are interested to know what will happen if the Canadian Pacific withdraws from the rate agreement, or tries to secure Missouri River traffic by cut rates. Will the decision remain in force? Apparently not. The Canadian road must have the co-operation of American lines from Emerson south, of course, and one of these lines has said that it withdrew from a traffic agreement with the Canadian road because the rates were so very low. Obviously the *natural* disadvantage of a line more than 3,000 miles long as a competitor of one of 2,000 is a strong factor in inducing the Canadian Pacific to maintain rates to Missouri River points. When it comes to dealing with Chicago or Boston the case is different; but then, Denver distributors of groceries probably would not complain of Chicago competition. The Commission says in its opinion "There are many factors in the situation which are obviously uncertain. The subject must be dealt with as somewhat experimental. It is not yet known that the present through rates can be maintained with a reasonable certainty of permanence, although the situation supports the belief that they may be." A statute which applies when the Canadian Pacific maintains rates and is suspended when it does not seems to us somewhat of a curiosity. And a construction of that statute which is based on the assumption that any given rate situation is going to be permanent rests on the most uncertain kind of a basis. We are not blaming the Commission. The case was a most perplexing one, and it was, perhaps, impossible for them to decide it in any other way. The difficulty lies in the Inter-state Commerce Act itself, which, by the short haul clause, makes through rates a sort of a standard for local ones, and at the same time, by the pooling clause, prevents them from having the necessary control over through rates themselves.

The First Step Toward Safe Wheels.

In our issue of May 11 we published the letters written to the Massachusetts Railroad Commissioners by various railroad officers on the subject of steel-tired and chilled wheels. In what we have to say now we do not propose to touch upon the relative merits of the two types. We do not set out to seek for the ideal wheel, but to consider facts as they are, and to indicate a *practicable* remedy for a recognized evil. The great fact stands that "the chilled wheel is, and for years must be, the standard wheel of the country."* Perhaps it always will be. Perhaps, on the other hand, it will finally be superseded by a solid steel wheel, and it is quite possible that it may give way eventually to some form of built-up wheel with a steel tire, but in all human probability neither of these results is imminent; and if either of them is brought about it will be rather as a measure of economy than of safety, for it is hardly to be doubted that a chilled wheel *can be made* that will be so safe that the railroads will feel justified in retaining it. Improvements in the manipulation of steel, or increase in the size of wheels, may bring it to pass that chilled wheels are no longer the cheapest, but there is no likelihood that they will be finally discarded as unsafe.

In the letters published by the Commission Mr. T. N. Ely, General Superintendent of Motive Power, Pennsylvania Railroad, says: "The experience of this company * * shows that cast iron wheels can be made perfectly safe for passenger and freight service, and on the ground of safety we would not think of abandoning their use for wheels made from any other material that we know of, including the various styles of steel-tired wheels." Mr. J. N. Barr, Superintendent of Motive Power, Chicago, Milwaukee & St. Paul, says: "My experience as a matter of record * * is that steel-tired wheels are more liable to break than good cast iron wheels." He thinks that it will shortly be possible to demonstrate that steel-tired wheels are not as safe as those of cast iron. The letter of Mr. G. W. Rhodes, Superintendent of Motive Power, Chicago, Burlington & Quincy, contains no such definite statement of his belief as to the relative safety of the two types, but it appears that while over 86 per cent. of the wheels under his passenger equipment are cast iron, none were removed in 1887 on ac-

* *Railroad Gazette*, Feb. 11, 1888.

count of being broken. There were no more cases of cracked flanges and rims than with the steel tires. He is now advocating the use of steel-tired wheels in fast passenger service merely because it is desired to use 42-in. wheels, and because "this size of wheel, when made of cast iron, is exceedingly heavy and difficult to manufacture." At a meeting of the New England Railroad Club last February, Mr. Lauder said. "It is an open question yet whether there is any wheel safer than a good chilled iron wheel, made by a responsible maker, and furnished at a price at which he can afford to make a good wheel."

It is not necessary to go further to seek for arguments to enforce what we have said—that there is no likelihood that the chilled wheel will be given up because it is necessarily unsafe. The experience of the gentlemen whose words have been quoted has been immense, and no one doubts their ability to draw correct conclusions, or their candor.

But the fact must not be lost sight of that they are all speaking of wheels of the highest standards and not of the average wheel. They are speaking only of the wheels made or purchased by their own companies. With regard to chilled wheels in general Mr. Ely says that "appreciating the fact that the market has from time to time been *flooded with wheels which are not safe*," his company prepared certain specifications; and Mr. Barr says that the specifications proposed by the joint conference committee of the Wheel Makers, Car-Builders and Master Mechanics "would exclude nine-tenths of the cast-iron wheels made in this country." In the same document from which we have quoted, Mr. Herbert Wallis, Mechanical Superintendent of the Grand Trunk, gives the cast iron wheels discarded from the passenger service of his road in 1887 on account of cracks or breakages as 8 per cent.; and from the freight service 2 per cent. were discarded. The average of all was but little over 2 per cent., as the cast iron wheels in freight service very greatly exceeded in number those in the passenger service. But even two per cent. per annum is a tremendous number of wheels to lose from one cause. Three months ago Mr. Lobdell, a veteran wheel maker, speaking before the New England Railroad Club, said that thousands of the wheels now in use would not pass the Pennsylvania tests, and he probably might have said hundreds of thousands. He further said: "Judging from the character of many old wheels that I have seen broken, I think that the makers of them would not wish to ride in cars under which they had been placed if they knew their character."

It appears, therefore, on good authority, that cast iron wheels may be practically safe. It appears on quite as good authority that many of those in daily use, perhaps most of them, are extremely dangerous. What is the matter? Where is the remedy?

The direction in which to look for the answer to these questions is suggested by the experience of a certain wheelmaker, and there is good reason to think that his experience is not very exceptional. In making up his balance sheet lately for the last year's business, he found that his profits in his wheel department amounted to 15 cents a wheel, or just about 1.3 per cent. on the capital invested in the plant. Having a good reputation to lose he had kept the average price of his 550-lb. wheels at $10. He had used good iron and made good wheels, and his sales had been sufficient to keep his plant fairly busy. He has made wheels for years, and is satisfied that his work is economically done. But his wheels cost him $9.85, and he cannot be convinced that any money can be made by selling a good 550-lb. wheel for $7.50, and probably will agree with Mr. Lauder that the maker who sells, or the car-builder who uses a 550-lb. wheel at $6.75 should be shot. A few figures will show how narrow is the margin of profit in reliable wheels at present prices. The material specification of the Chicago, Burlington & Quincy for chilled wheels for all service is: One-third Salisbury iron, one-third Hanging Rock and Southern pig, one-third old wheels. We may take the prices of these irons at the following figures: Salisbury, $32; old wheels, $18.50; other iron, say $26 per ton. The average is $25.50 per ton, or allowing for loss of weight in manufacture, the iron for a ton of wheels of this mixture will cost, say, $27, or $6.63 for a 550-lb. wheel. One experienced maker, basing his estimate on a pretty large output, gives the cost of manufacture as $2.50 per wheel of the above weight. Whether or not his wheels cost too much to make, it is quite evident that a wheel that will satisfy Mr. Rhodes cannot be made for less than $9, allowing no profit whatever. There are those, in fact, who insist that a really good wheel, made of first-class iron and properly manipulated, should not be sold for less than three cents per pound.

But it may be held that a cheaper mixture than that required by the Chicago, Burlington & Quincy will still make a safe wheel, and we are told that the rigorous physical tests of the Pennsylvania are endured by wheels made with 40 per cent. of old wheels. Admitting this, let us take a mixture of 60 per cent. at $26 per ton, and 40 per cent. at $18.50. The result will cost $23, and adding 6 per cent. for waste, we have a mixture which costs $24.38 per gross ton. A 550-lb. wheel made from this cannot *cost* less than $8 50, material and making included. One maker estimates an extra expense of 75 cents per wheel in manufacture to make wheels that will conform to the Pennsylvania inspection and tests.

It is well-known, however, that many wheels have been sold the last year under $7; and the best makers have repeatedly, in that time, turned away orders at $7.50. But one of two conclusions is possible. Either the wheel makers have been making presents to the railroads of part of their wheels, or the wheels furnished have been of dangerously poor metal. Which alternative is the more probable our readers can judge for themselves.

Much more might be said in this direction, but we have preferred to understate the facts as to cost of material rather than to seem to exaggerate them; and investigation as to the necessary cost of proper qualities of pig iron, and as to the cost of proper methods of manufacture are earnestly recommended to the committees of the Car-Builders' and Master Mechanics' Associations who are considering this matter with the Wheel Makers' Committee. A brief but accurate report from them would assuredly have the effect of making many officers suspicious of wheels that are offered at a price per pound less than the market price of good wheel irons.

But the wheel makers have a duty to themselves. They cannot expect the railroads to voluntarily put up prices. It is not likely that the wheel makers could, if they wished, agree upon and maintain amongst themselves an arbitrary scale of prices. Even if they could do so the case would not be covered. The prices might enable makers to produce good wheels at some profit, but they would not *compel* them to. They can, however, agree upon tests and specifications which only safe and serviceable wheels will endure, and which the Master Car-Builders' and Master Mechanics' Associations can accept and recommend for adoption by the roads. If these tests and specifications are not adopted by any one road, in the purchase of wheels, the fact will be *prima facie* evidence of negligence on the part of that road, both in the courts and before the public. If they are adopted the most dangerous element in competition will be eliminated. The recommendations of the joint committee of the three associations will stand as a definite and available standard by which the practice of the railroads and of the wheel makers can be measured.

We understand that the joint committee will present at the coming conventions certain recommendations as to specifications and physical tests, and probably as to a basis of guarantee of life. The specifications will not prescribe, we believe, the kinds or proportions of iron that may be used. This would be impracticable except in the most general way. It might be well to limit the percentage of old wheels; although, inasmuch as old wheels vary greatly in quality, this limitation would in itself tell but little as to the quality of the wheel produced.

The guarantee of life we understand will probably be fixed on a basis of 50,000 miles for passenger service, three years for ordinary freight service and two years for line cars. We have already stated (*Railroad Gazette*, Feb. 24) our objections to the guarantee system, and we still think that the advantages expected from it can only be partly realized, and that it is always cumbersome, and often positively unjust. We will not repeat here the argument of the former article on this subject, but suggest that the vital thing now is to concentrate attention and action on the measures that promise the best and quickest results. These we are convinced are to be had only by specifications and tests so complete, precise and rigorous that the wheels that pass them can safely be bought absolutely, subject to no conditions as to life or endurance. Mileage or time guarantees may be demanded probably without harm and perhaps with benefit, but they ought not to take the place in the smallest degree of careful specifications and rigid tests.

April Accidents.

Our record of train accidents in April, given in this number, includes 49 collisions, 83 derailments and 4 other accidents; a total of 136 accidents, in which 42 persons were killed and 191 injured.

These accidents are classified as follows:

COLLISIONS:		
Rear	23	
Butting	20	
Crossing and miscellaneous	6	
		— 49
DERAILMENTS:		
Loose or spread rail	5	
Broken bridge	6	
Defective switch	1	
Broken wheel	1	
Broken axle	2	
Broken truck	3	
Fallen brake	2	
Misplaced switch	15	
Runaway train	1	
Open draw	1	
Reckless engineman	1	
Bad loading	1	
Cattle on track	4	
Washout	3	
Landslide	1	
Flood over track	1	
Accidental obstruction	1	
Malicious obstruction	1	
Purposely misplaced switch	3	
Unexplained	30	
		— 83
OTHER ACCIDENTS:		
Boiler explosions	2	
Cylinder explosion	1	
Collapsed flue	1	
		— 4
Total number of accidents		136

The causes of collisions where given were as follows:

	Rear.	Butting.	Other.	Total.
Trains breaking in two	3	..	..	3
Misplaced switch	2	3	..	5
Failure to give or observe signal	2	..	1	3
Mistake in giving or understanding orders	..	4	..	4
Miscellaneous	5	3	2	10
Unexplained	11	10	3	24
Total	23	20	6	49

A general classification shows:

	Collisions.	Derailments.	Other.	Total.	P. c.
Defects of road	..	12	..	12	9
Defects of equipment	3	8	4	15	11
Negligence in operating	21	19	..	40	29
Unforeseen obstructions	1	14	..	15	11
Unexplained	24	30	..	54	40
Total	49	83	4	136	100

The number of trains involved is as follows:

	Collisions.	Derailments.	Other.	Total.	P.c.
Passenger	16	29	1	46	25
Freight and other	78	54	3	135	75
Total	94	83	4	181	100

The casualties may be divided as follows:

KILLED:	Collisions.	Derailments.	Other.	Total.	P. c.
Employés	9	19	5	33	80
Passengers	..	8	..	8	19
Others	..	1	..	1	1
Total	9	28	5	42	100
INJURED:					
Employés	45	56	6	107	56
Passengers	30	54	..	84	44
Others	..	..	..	..	..
Total	75	110	6	191	100

Twenty-three accidents caused the death of one or more persons, and 41 caused injury but not death, leaving 72 (53 per cent. of the whole) which caused no personal injury worthy of record.

The comparison with April, 1887, shows:

	1888.	1887.
Rear collisions	23	11
Butting "	20	17
Crossing "	6	..
Derailments	83	58
Other accidents	4	4
Total "	136	90
Employés killed	33	36
Others "	9	5
Employés injured	107	74
Others "	84	34
Pass. trains involved	46	26
Average per day:		
Accidents	4.53	3.00
Killed	1.40	1.37
Injured	6.20	3.60
Average per accident:		
Killed	0.308	0.455
Injured	1.368	1.200

There are no startling comparisons with last year's record, though there are increases in nearly every item including the number of persons killed. Misplaced switches were numerous and were discussed last week. Derailment of a car by reason of its contents not staying where they were put, which we chronicled last month as somewhat exceptional, has happened again, this time at Pittsburgh. Reckless running seems to have been the cause of a derailment at Winnemucca, Nev., on the 27th, an engineman, apparently unacquainted with the road, dashing through the yard at a divisional terminus as though he had ten miles of plain sailing before him. The sending out of a runner wholly unacquainted with the road implies recklessness on the part of the engine dispatcher; the sending of one only partially acquainted, which seems to be a growing practice in some localities, may reasonably raise the same presumption. The derailment at Rockingham, Vt., April 6, in which an engine and several cars went down a 25-ft. embankment, was investigated by the State Railroad Commissioners, but their report sheds no light on the cause. The newspaper reports indicated that improper material had been used in the construction of the embaukment (nearly 40 years ago), and that the slipping out of this material was the cause of the insecurity of the roadbed, but the Commissioners' report only says:

"The accident was undoubtedly caused by the sliding away of the ground which had been suddenly softened by a heavy thaw. The board recommends that the road in reconstructing the embankment take such measures to guard against a recurrence of the slide as prudence and good engineering may require in view of the revealed dangers of the place, and, also, that the embankment adjacent to this point be so strengthened that there may be no possibility of a recurrence of this slide there. The board would recommend the con-

struction of several additional sluices or outlets from the ditch upon the upper side of the track along the hillside north of this place, for the purpose of carrying off the surface water from said ditch."

The New York Commissioners have made a report on the derailment at Portville April 28. They say:

"The direct cause of the accident, as nearly as could be ascertained by different inquiry of train and trackmen by the inspector, was the spreading of the rails on east side of track by reason of expansion under the excessive heat of the sun. The temperature about midday was over 100 degress in the sun, and the derailment occurred about 11:30 a. m. The bulging of rails was owing to some extent to the poor condition of the sleepers, but this cause was secondary. The inspector also reports that there are too many unsound ties on this and other points of the road. * *"

The collision in Philadelphia the 15th was one of the most notable of the month, for the reason that it occurred at a point protected by the most approved appliances. The semaphore signal is in a favorable location, and there are no surrounding objects to obscure it or distract the attention, night or day. The Pennsylvania does not, we believe, have a specially stringent rule concerning the duty of firemen to watch for fixed signals; but it is plain that, in a yard like Broad street and its approaches, where trains running at high speed are crossing each other's paths hundreds of times daily, constant dependence on one man alone (the engineman) to infallibly observe the signals must once in a while lead to a collision.

A high wind in Indiana overturned four empty freight cars standing on a side track, but no train accident is reported from this cause. A similar case was reported May 11, 16 cars being blown off their trucks. Both these mishaps were on standard gauge roads. On the Canadian Pacific in the Rocky Mountains a timber was blown across the track on a new bridge which was being erected and the engine of a passenger train was thrown at right angles to the track while on the bridge, but it fortunately did not fall through. A freight conductor in Kentucky who was attempting to repair a leak in a barrel of oil in a freight car in the night, dropped his lantern, which broke and exploded the oil, killing the conductor and two men who were with him.

German Railroad Statistics for 1886-7.

It is never easy to compare the railroad statistics of two different countries. Many of the standards of comparison are different. In the German statistics, for instance, no attempt is made to separate passenger and freight train mileage. The axle and not the train is made the unit of carrying power. When train-loads are spoken of, the gross weight is counted in German statistics, and not the net weight of the load. Direct comparisons of prices paid are often still more misleading. The same item often has a different meaning in different countries; and, even when it means the same thing, the incidental conditions of service and payment are sometimes so different as to make the direct comparison useless. Yet, with all these drawbacks, the comparison is worth making.

In the following tables, the fiscal years for the German roads average a few months later than those for the American roads as taken from Poor's Manual for 1887.

	Germany.	United States.
Length of line ... ...miles..	23,913	133,607
" " track ..... " ..	40 564	168,048
" " steel rails. .. " ..	20.711	105.724
Population	47,000,000	58,000,000 (?)
Miles of railroad for every 100,000 inhabitants	51	229

Had the return been based on miles in operation, the last ratio would have been a trifle less favorable to the United States. It is hardly necessary to add that this difference is largely due to our sparser population; and that if we compare mileage with *area*, Germany has an overwhelming advantage.

It is a little curious that the proportion of steel rails as compared with total track should be smaller in Germany than in the United States. Inasmuch as so many German roads are double tracked with steel, the proportion of iron rails on other parts of the main line (as distinct from sidings) must be very large.

	Germany.	United States.
Capitalization	$2,356,000,000	$8,163,000,000
" per mile ...	99,400	61,100

The cost of construction, equipment and other legitimate assets in Germany was about 2½ per cent. less than the present capitalization, or about $97,000 per mile. The difference was made not by stock watering, but by appreciation of values between the times of private construction and state purchase. What was the corresponding figure of actual cost in America, it is beyond the power of any human being to say.

EQUIPMENT.

	Germany. Total.	Germany. Per 100 miles.	United States. Total.	United States. Per 100 miles.
Locomotives.....	12,642	53	26,415	21
Pass. cars.....	23,224	98	19,252	15
Baggage, etc....	251,735	1,053	6,325	5
Freight.....			845,914	677

The averages for equipment in the United States are calculated on the basis of mileage operated and not on that of the total constructed.

WORK DONE.

	Germany.	United States.
Revenue train-miles.....	102,500,000	569,700,000
Passengers carried.....	295,800,000	382,285,000
Passenger-miles.....	5,227,000,000	9,659,700,000
Freight carried tons.....	179,100,000	482,245,000
Ton miles....	11,772,000,000	52,802,000,000
Receipts—Passengers.....	$66,000,000	$212,000,000
" per pass. mile (cts.).	1.25	2.18
" freight.....	$166,000,000	$550,000.000
" per ton-mile (cts.)..	1.55	1 04
Operating expenses.....	$135,000,000	$525,000,000
Per cent. of earnings.....	54.9	63.8
Percentage net earn. to capital.	4.7	3.6

It will be noted that the work done on German roads seems small in comparison with the amount of equipment. The average locomotive ran only 8,000 revenue train miles in Germany, as compared with 21,600 miles in the United States. The car mileage would almost certainly show a somewhat similar difference. Average length of haul is nearly twice as great in the United States as in Germany.

No comparison of train-loads is possible because of the failure to separate passenger and freight train statistics in the German returns. Nor would such comparison be exactly fair, on account of the different character of the equipment in the two countries.

A few descriptive items under the latter head may not be out of place. The German locomotive weighs on an average from 43 to 44 tons. The average cost is a little over $11,000. The average gross train load (including the train itself) is 273 tons. The great majority of cars, whether passenger or freight, have but two axles. A passenger car seats something over 40 passengers, and apparently costs, on an average, less than $2,000. Freight cars have an average capacity of not quite 11 tons, and seem to have cost on an average about $700—rather a high figure in proportion to the passenger car cost. Statistics of car weight are not given in the abstract before us; but we believe it to be about 10 tons dead weight for passenger cars and 7 tons for freight.

The economy in the use of German equipment does not seem as good as it ought to be. We have already cited the small locomotive performances. Of the total locomotive mileage, only two-thirds is connected with train-earning revenue. Nor does the car space appear to be well utilized. The average load per loaded car is less than 8 tons; the average per car moved, little over 5 tons.

The proportion of gross earnings from passengers and freight is nearly the same in the two countries. The volume of passenger traffic is relatively much greater in Germany, but the rates are correspondingly lower; while the reverse is, of course, true of freight traffic. The ratio of gross earnings to capital is not much greater in Germany than with us; but the percentage of operating expenses being smaller, the return on capital is greater.

Annual Reports.

St. Louis & San Francisco.—This is a good report, both in the facts themselves and in the way in which they are presented. The general results were as follows:

	1887.	1886.
Miles operated.....	1.095	878
Earnings, passenger.....	$1,286,314	$997,288
Earnings, freight	4,506,052	3,517.578
Total, including miscellaneous.....	$6,229,345	$4,874,628
Operating expenses, including taxes and improvements.....	2,981,867	2,222.296
Net revenue.....	$3,247,478	$2,652,332

The interest charges being less than two and a quarter millions, this gave, besides the regular 7 per cent. dividend on first preferred stock, a dividend of 2½ per cent. on preferred, and left a surplus of $653,000 for the year.

The capital account at the close of the two years has been as follows:

	1887.	1886.
Stock—1st Preferred.....	$1,500,000	Same.
Preferred.....	10.000,000	
Common.....	15,500,000	
Bonds	31,776,000	$25,879,000
Current liabilities.....	2,787,675	4,622,622
Surplus.....	3,760,134	3,107,226

New road between Fort Smith and Paris—170 miles—was opened July 1, making connections with the transcontinental branch of the Texas & Pacific, and with the Gulf, Colorado & Santa Fe. This was the most important extension. Large additions to the terminal facilities at Monett were made at the same time. In spite of the rapid extensions the gross earnings per mile are greater than in any year of the company's history except 1884, while the net earnings per mile show but a very slight decrease, and the capital account per mile a most decided diminution.

The different elements of operating expenses show no very great differences in proportionate increase. It should, however, be noticed that $177,000 of new improvements were charged to operating expenses in 1887, against $56,000 in 1886 and $27,000 in 1885; and that too, without scrimping the regular maintenance charges.

Some of the main statistics of operation are as follows:

	Train miles	Earnings per mile.	Cost per mile.
During 1885.....	2,741,479	$1.5989	$0.6601
During 1886	3,195,517	1.5255	.6412
During 1887..	4,066,278	1.5320	.6562
	Ton-miles.	Revenue.	Cost.
In 1885.....	217,670,261	$0.0143	$0.00586
In 1886..... ...	246,379,627	.0143	.00586
In 1887	309,496,860	.0146	.00594
	Passenger-miles.	Revenue.	Cost.
In 1885	32,165,971	$0.0282	$0.0166
In 1886.....	37,907,215	.0263	.0160
In 1887....	49,516,497	.0260	.0168

Louisville, New Albany & Chicago.—This company is at last able to show a surplus instead of a deficit. The figures for successive years are the best comment which we can give on the management of the property.

	1884.	1885	1886.	1887.
Gross earnings.	$1,564,436	$1,680,455	$1,919,190	$2,295,623
Operating expenses.....	1,365,144	1,332,036	1,278,528	1,489,698
Net earnings.	$199,292	$348,419	$640,662	$805,925
Fixed charges, taxes, etc....	623,123	637,251	735,408	803,455
Deficit..	$433,831	$288,832	$94,746	Surplus $2,470
Per cent. operating exps. to earnings..	87.23	79.27	66.62	64.89

This change is due to increased volume of traffic. Rates have on the whole fallen pretty continuously. Freight charges per ton-mile were 0.98 cent in 1884, and only 0.804 cent in 1887. This fall is the more noticeable because local business has developed faster in proportion than through business. On the other hand there has been a distinct increase, not merely in the train service itself but in the train-loads, both freight and passenger.

The capital account has increased somewhat over a million dollars during the past year by an issue of new bonds. Nearly all of it has been used in the purchase of equipment. This being the case, it is especially gratifying to see a liberal allowance in the operating expenses themselves for maintenance of motive power and cars. A narrow surplus is apt to be regarded as the result of tricks of accounting; but in this case, it seems to have been fairly earned.

Pittsburgh, Cincinnati & St. Louis.—The most noticeable feature in this report is a change in the general balance sheet from a deficit of $119,000 to a surplus of $469,000. The comparative figures are as follows:

	1887.	1886.
Earnings, freight	$4,327,355	$3,504,742
Passenger	1,116,053	915,302
Total, including miscellaneous	5,808,378	4,752,596
Operating expenses.....	4,017,218	3,130,690
Net earnings, including car hire, etc.	1,796,936	1,626,880

Unfortunately, the company, besides its own fixed charges of nearly a million, suffers a further net loss of about $200,000 on the leased lines, so that the actual surplus was reduced to $603,000, practically, the whole of which was carried to capital account.

The real condition of the road improved more than these figures would indicate. The large increase in operating expenses was much of it apparent rather than real; that is, it was due to liberal appropriations for repairs and renewals. Nearly half of it was due to maintenance of way alone. Expenses for transportation and motive power increased only 17 per cent., or much less rapidly than the traffic receipts. The traffic showed an unusually even development. Tonnage, passengers, length of haul, and receipts per ton or passenger mile all show a marked increase. An interesting feature of the traffic returns, is the great increase in movement of loaded cars westward, while the change in this respect in east-bound cars has been very slight.

Cincinnati & Muskingum Valley.—This road was until quite recently leased by the P., C. & St. L. Its gross earnings increased from $391,000 in 1886 to $441,000 in 1887; but unluckily its operating expenses increased from $317,000 to $396,000, leaving net earnings of less than $45,000. Of this $42,000 was spent for improvements, settlement of old accounts, etc., leaving an available income of $3,000 with which to pay $105,000 of interest on first mortgage bonds—not exactly an encouraging outlook for the bondholders, and still less so for any other financial interests.

Toledo, Ann Arbor & North Michigan.—This report is not well arranged. Figures are given to show the growth of traffic; but there are no corresponding figures of mileage. There is, we believe, not even a statement of miles operated in 1887. Comparative figures are of little use under these circumstances.

Gross earnings for the year were $535,000; net earnings $193,000. Interest on bonds amounted to about $185,000 leaving a net surplus for year of $8,000. Inasmuch as the capital stock amounts to a trifle over four million dollars, the profit-sharing scheme, by which employés are to receive stock allotments as proportions of dividends seems to be a castle in the air, hardly worth the amount of space which is devoted to its explanation.

The report calls attention to the fact that the south-bound traffic for 1887 increased from less than 20 per cent. of the whole to over 30 per cent. If this was the case, it is unfortunate that the average train load (ton mileage divided by freight train mileage) should have diminished about five tons. We are inclined to think that the statement in the body of the report must be a mistake. The figures in the appendix, such as they are, do not warrant it.

Facilities for passenger travel continue to improve, and the addition of new improvements keeps pace with the growth of business. The general business of the country, and the consequent volume of freight traffic, will probably be no greater than last year, and perhaps less; but the natural increase in population, the fact that people have some of last year's earnings to spend, even if they enjoy no marked prosperity this year, and the constantly growing skill of the passenger agents in developing excursions and other special traffic, will undoubtedly keep passenger traffic fully as prosperous as was last year's and warrant the keeping of the passenger service fully up to its present standard. The prominent roads have added new and elegant day cars in lavish profusion, the New York Central, Reading, Boston & Albany, New York, New Haven & Hartford and Chicago & Alton, not to mention the new roads, being among those that have put them on by the dozen. All of these cars which we have seen are models of elegance, gaudiness being wholly absent. It is to be regretted that the Eastern roads and some others do not follow the example of the Southwestern lines in putting into use some of the excellent reclining chairs that have become so popular where they are used. Between the complete luxuries of a sleeper and the cramped uprightness which one is confined to in the ordinary passenger car there surely ought to be some happy medium which all roads could provide.

Vestible trains seem to be popular on all sides. The Chicago & Northwestern has one between Chicago and Minneapolis, the Chicago & Alton one between Chicago and St. Louis, and the Louisville & Nashville one between Cincinnati and New Orleans. The spring time-tables of many roads

show additions to the train service. The Erie announces a train out of New York at 4 a. m., for the special benefit of suburban residents who do night work in the city. The Pennsylvania will, according to a St. Louis dispatch, soon put on a limited vestibule train between that city and New York. The train which now connects with the Chicago limited at Pittsburgh runs between Pittsburgh and St. Louis in about 21 hours. If the new train runs as fast as the limited on the Fort Wayne road (about 37 miles an hour), it will shorten the time four or five hours. A train could leave New York at 6 p. m. and reach St. Louis the next night at 10:30 or 11.

It is to be hoped that the great expenditures for all these elegancies and comforts to attract the traveler have not unduly reduced the appropriations for track maintenance, distant signals, bridge guard timbers, freight car wheels, inspectors of personnel and other departments, which all either directly or indirectly affect the safety of the thousands of passengers which these comfortable cars will daily carry.

The Boston & Albany have printed a neat little volume containing a descriptive list of the locomotives on that line. The engines are given in numerical order, and the following particulars are given as regards each engine: Name of builder, year built, total weight, boiler pressure, diameter and stroke of cylinders, diameter and number of driving wheels and kind of tire fastening, diameter of truck wheels, material used for driving boxes and cross-heads, kind of packing used for valve stems and piston rods, style of slide-valve and smoke arch, kind of brake used, whether Westinghouse automatic for train or simply a steam driver brake. The remaining columns state whether the engine is equipped for operating the Martin system of car heating or not, and show the division on which the engine is stationed and the service on which it is engaged. A few particulars are also given as regards the tender, the diameter of the wheels, the contents of the tank, and the kind of coupler on rear end of tender.

The list gives particulars of 252 locomotives, of which number 50 carry 160 lbs. boiler pressure, the remaining engines being returned as carrying 130 lbs. per sq. in. Nearly all the engines are of the American type, with only four wheels coupled, though the cylinders are often of considerable size, some engines having 18¾ × 28 cylinders and 54 in. wheels, which proportions give a tractive force of nearly 177 lbs. per lb. average pressure in the cylinders, which would give a maximum tractive force of fully 19,000 lbs., which is nearly ¼ of the *total* weight of the engine. These engines were built some years ago, and were doubtless found to be over-cylindered, as recent engines have a much more liberal allowance of adhesion weight in proportion to the tractive force.

No less than 90 engines have the driving tires secured with the Mansell fastening, and in this respect the Boston & Albany sets an excellent example to other roads, for in few cases is any provision made for retaining a driving tire in place should a fracture occur.

Many of the driving boxes and cross-heads are made of cast steel, and most of the rods are packed with U. S. metallic packing, while nearly all the slide valves are balanced. The extended smoke arch is in use on over 50 engines, chiefly in passenger service.

The fittings and connections for the Martin system of continuous heating are upon 62 engines, and none of the engines appear to be fitted with the couplings, etc., for any other system of heating.

A passenger brakeman on a road where pretty good discipline is maintained, had a sharp dispute with a passenger the other day concerning the opening or shutting of a door or window, or some such trifle. The writer (who was in the car) did not learn the merits of the discussion, but a passenger at his side remarked that the brakeman in question was habitually quarrelsome and always offensively wordy to his the passenger's) personal knowledge. It was suggested in reply that his duty to the public required him to report the brakeman's behavior to the superintendent of the road. "Oh, that will only bring distress to the poor brakeman's wife and children," was the prompt response; and it is this remark of the passenger that we wish to preach about.

This brakeman, a great many other brakemen, and hundreds of ticket sellers, gatemen and others who deal with the public, perform all their duties fairly well, with the exception that suavity is unnatural to them, and gruffness and reticence, or—in extreme cases like this—a fondness for picking quarrels *are* natural to them, as swimming is to a duck. This neither makes nor ruins the reputation of a road, but it renders many passengers temporarily uncomfortable, and so does have an influence on patronage. A forty-mile journey in a splendid new car over a road as smooth as Dr. Dudley's dynagraph ever saw was made unpleasant the other day simply by the rudeness of two brakemen, who shouted the names of the stations in an excessively loud, blatant and flippant way. The offense against the passengers was not of a kind to be formulated in a complaint, but the lack of anything like deference, or even respect toward them, was most apparent. It would not have been tolerated in a Pullman car for a single day; and indeed would not be indulged in in the presence of a superintendent, or of a conductor who had a nice sense of decorum. The query concerning the quarrelsome brakeman, and these rowdyish ones is, are they retained in their places because the superintendent has toward these men's dependent families the same tender feelings that animated the passenger referred to? We fear that such is the case. Superintendents do shrink from maintaining high discipline when they know it will crowd well disposed men out of the ranks. It is realized that the pay is not high; that "all the cardinal virtues cannot be had for $13 a month," and benevolent good nature prevails. But "business" demands different treatment. A man who cannot be polite is no more fit for a passenger brakeman than for an usher at the White House or a Yale College class-day reception. If he is in such a place it is evident that he got in by some injustice or oversight. If his proper work is shoveling coal or oiling freight cars, justice to society demands that he be put to such work, and there is no injustice to his family in doing it. Consideration for the family may call for extra exertions in getting the man a position that he can fill, but nothing should be regarded as justifying keeping him in a place which he cannot fill.

Outside guard timbers on a short bridge appear to have saved a passenger train on the New York & New England from a serious accident on Tuesday morning, May 15. One section of the New York and Washington express, eastbound, was made up at Putnam of an express car, a day car, a combination baggage and smoking car, and another day car. From some unknown cause the rear truck of the third car became derailed in passing a frog at Dedham Junction while the train was running at 25 or 30 miles an hour. Both pairs of wheels left the rails and ran over the ties for about 3,700 ft. Owing to the strength of the couplings, and the good condition of the track, the ballast being even with the top of the ties, and perhaps to other conditions, they kept close to the rails, so that the following car was not disturbed. The line at this point is straight. The brakeman in the rear car happened to notice that the motion of the car in front of him was irregular, pulled the bell cord and applied the air brake. Before the speed of the train had thus been reduced to less than 10 or 12 miles an hour it came to an iron bridge, a little under 12 ft. in length, spanning a highway, near Endicott station, 17 ft. above the ground. The derailed truck, which was on the right hand side of the track, at this point swerved still further to the right, and was stripped from under the car which it supported, letting the end drop, while the truck itself was found jammed close up to the forward truck of the car following. It stopped on the bridge.

All bridges on the New York & New England exceeding 12 ft. in length, and their approaches, are provided with inner iron guard rails, extending beyond the bridge from 100 to 300 ft. The floor of the bridge at Endicott was composed of 8 × 10 in. oak ties 10 ft. in length, and spaced about 6 in. apart in the clear. About 18 in. outside of the outer rail is a 7 × 8 in. guard timber of hard pine, fastened to every third tie with ¾ in. bolts. This is the standard practice of the New York & New England.

When the derailed truck struck the bridge its course to the right was intercepted by the guard timber, along the side of which it slid until it stopped. Division Superintendent R. E. Eavenson is most decidedly of the opinion that if it had not been for the guard timber the truck would have gone off the end of the ties into the road, probably taking with it the rear car of the train, if not the one to which it belonged. There were 15 or 20 persons in the combination car and half a dozen in the next one. The jar of the stop on the bridge was not sufficient to attract especial attention at the front of the train.

The Glasgow International Exhibition was opened on May 8 by the Prince and Princess of Wales, and is expected to be as successful as that held last year at Manchester. The exhibit of machinery is especially large and varied and embraces not only the latest forms, but many interesting relics, such as Watts' original model of the steam engine, the engines of the Comet, etc. The Machinery Annex is over 300 ft. long by nearly 300 ft. wide, and has a floor area of 140,000 sq. ft. Nine bays run the full length of the building, the centre one being wider than the rest, and provided with stronger foundation and supports for the heavier kinds of machinery located in it. A 20-ton traveling crane of 41 ft. span is fixed overhead in this bay, and is driven from an endless rope. The motive power is supplied by an engine of the inverted type, placed in a corner of the building.

Four engines do all the driving, two being of the Westinghouse type. The shafting is carried by the vertical columns separating the various bays. The engines and dynamos for supplying the electric light are placed in a separate house, 118 ft. by 100 ft., adjoining the boiler-house. The engines are by numerous makers, and form an exhibit in themselves well worthy of inspection. The lighting is done, for the most part, by the Brush company, and, altogether, the light is equivalent to more than 1,000,000 candles. A few rooms are lighted by oil and gas lamps of an ornamental description.

The Machinery Hall of the French International Exhibition, to be held in Paris in 1889, will be covered with the largest span roof in existence. The nave of this hall will be 1,378 ft. long and the clear span will be 374 ft., the height in the centre being 147 ft. 7 in. These dimensions are largely in excess of those of the largest existing roof in one span, that over the St. Pancras passenger station of the Midland Railway in London. This roof is 240 ft. span and 98 ft. high. The principals of the great French roof are pitched no less than 69 ft. apart, so that the purlins exceed in span an ordinary roof. The central span is flanked by two galleries, each 48 ft. broad. The floor area of the machinery hall, including galleries, is to be 565,000 sq. ft., or nearly 13 acres.

Numerous traveling bridges will be provided in this immense building in order that visitors may obtain a general view of the hall and its contents. A roof, reaching nearly as far as from Trinity Church to the Post Office and nearly high enough to take in the Equitable Building, should certainly form a unique sight, especially when filled with a great variety of fine machinery from all parts of the world.

Some experiments have been made lately to caseharden mild steel, but the results were not as good as those obtained from the best quality of wrought iron. The greater homegeneity of steel and its freedom from flaws, cinder, etc. would render it especially suitable to produce smooth casehardened work, but it appears that some special mixture is necessary for casehardening, and it is also probable that the steel should contain a larger proportion of silicon than is usually found in mild steel.

A new departure in lighting the entrance to harbors will shortly be tried on a large scale. Vessels passing through the Suez Canal have been for some years guided by buoys illuminated by compressed oil gas, but recent experiments with buoys lit by electricity having proved successful, the Gedney channel in New York Harbor is to be lit with the McKenzie Mills system of electric light buoys. Six will be used, three on each side of the channel, placed about 1,100 ft. apart. These buoys are expected to light the channel so that vessels can enter the harbor at night as safely as in the day time. The battery will be located at the Sandy Hook Light Station and the lights will be controlled from that point. The establishment of these lights will cost about $26,000, and they can be maintained at a cost of $3,000 a year.

NEW PUBLICATIONS.

Snow Drifting and Snow Protection Arrangements. By E. Schubert, Traffic Inspector and Superintendent of Construction of the Sorau District; J. F. Bergmann, Wiesbaden; G. Stechert, New York.

We are in receipt of the above which is called as a sub-title: "A contribution to the theoretical development and practical solution of the snow protection question." The theoretical part of the question is treated at great length. It does not appear, however, that the author reaches any valuable formulation of the snow protective methods by which a roadmaster can, for any given situation, set his protections, whether embankments, hedges, trees, plantations, or fences, in such a way as to be immediately effective. In fact, the author's deductions go rather to disqualify all forms of protection other than movable fences, for they show if they show anything, that any form of protection must be set at least eight times its height from the edge of the cut to be of any use. Hence the fence or other protection must be set outside of the usual right of way, where, if allowed to remain during the summer, it would be an injury to the adjoining property.

The deductions are furthermore based on assumptions of the size of drifts, which would not conform to the conditions of any two neighborhoods. If a movable fence is to be used it can be much better located by observation of the snow drifting and by general experience than by any mathematical theory.

Some of the author's remarks would incline one to believe that he had never had any practical experience with snow obstruction. For instance he observes that damp snow which is not drifted as it falls will not prove a serious obstruction to travel until it is deep enough to interfere with the locomotive ash pan. Comment is unnecessary, especially when it is considered that he is speaking of a country where the engines do not even have a pilot to clear the way with. But, perhaps, the different conditions in Germany make this remark less absurd than it appears.

He admits, however, that it is desirable to resort to some method of clearing the track before this depth is reached, and suggests besides the use of shovels, hand plows, and in case these means prove insufficient, a plow fastened—of all places—*behind* the locomotive!

The author recommends a plow which appears to be about such a machine as is used to clean paths in suburban neighborhoods, provided with cross benches on which several laborers are to sit. The post does not appear a highly desirable one under any circumstances, and when one imagines the plow's action when drawn behind a locomotive at a track clearing speed, the suggestion is highly humorous.

No mention is made of any of the more improved forms of snow plow except in a very cursory way. The author dismisses them with the remark that on such great systems as those of Germany such means of clearing the track cannot be considered admissible, and that the study must be rather to prevent the accumulation of snow on the track. This is a very sapient conclusion; but unless some more satisfactory methods can be found than the author has to offer it may be confidently expected that snow plows will form a very important adjunct to American railroads for some time to come, however contemptuously they may be regarded upon the vast systems of Germany.

Scribner's for June contains the first of the railroad articles which are to be published in that magazine. This one is "The Building of a Railway," by Mr. T. C. Clarke. It occupies 28 pages, and is illustrated by many engravings, some of which are very good and some are rather shabby and some are not particularly relevant to the text. Mr. Clarke points out briefly some of the chief facts which have governed in the construction of American railroads and have determined their character. He then treats of surveys and location, and very briefly of construction. Thirteen pages are devoted to bridges and permanent way. The statistics collected by Mr. Clarke show approximately 3,200 miles of railroad bridges of all kinds in the United States, including 2,127 miles of wooden trestle; and of the 1,086 miles of truss

bridges he estimates that three-fourths are of iron or steel. The chapter on bridges is not only interesting as a brief summary of the development of bridge building in the United States, but it contains some wholesome doctrine for railroad officers to read and apply.

TECHNICAL.

Locomotive Building.

The Tennessee Coal, Iron & Railroad Co. has just received a new switching engine.

The Baldwin Locomotive Works have delivered two freight engines to the Louisville Southern.

Car Notes.

The Youngstown Car Mfg. Co., of Youngstown, O., has completed 10 box cars for the Seattle, Lake Shore & Eastern. This road has purchased the wheels and axles for about 200 logging and ore cars, which it will erect at its shops in Seattle, W. T. The Pullman shops are also building four passenger cars for the same road.

The Michigan Car Works are building 100 refrigerator cars for the New York, Lake Erie & Western, and 15 of the same pattern for the Wheeling & Lake Erie.

The Janney coupler is being applied to 60 passenger cars on the Chicago, Burlington & Quincy. This road has hitherto used the Miller hook.

Bridge Notes.

The bridge and construction department of the Pencoyd Iron Works has just completed and shipped to the Baltimore division of the Northern Central road a double track through plate girder bridge, 90 ft 4 in. span, the girders for which weigh 35 tons each, the bridge as a whole weighing 120 tons. The girders, which are said to be the heaviest on the Pennsylvania system, required for their transportation the use of the new 100,000-lb. iron cars, illustrated in the *Railroad Gazette* May 11.

The Cincinnati, Sandusky & Cleveland has lately completed a 205-ft. iron bridge over the Olintangy River near Columbus Ohio. It was built by the Smith Bridge Co., at Toledo, O.

A 180-ft. bridge over the White River at Rockford, Ind., on the Jefferson, Madison & Indianapolis, has lately been renewed.

The following renewals have lately been made on the Chicago, St. Louis & Pittsburgh: A bridge of 280 ft. over the Miami River at Piqua, and a 105-ft. bridge over the White Water River, at Cambridge City.

The Missouri Valley Bridge & Iron Co., of Leavenworth, Kan., has lately completed three combination bridges of 130 ft. span each across the Big Blue River, on the Kansas City & Southern.

The Vincennes, Oakland City & Owensboro will build three bridges over the Ohio at Owensboro, Ky.

All the piers have now been erected for the bridge being built by the Mexican National over the Rio Grande River at Laredo, Tex. It has seven spans 150 ft. each, and is pin connected. It is expected that the superstructure will be completed by Aug. 1.

The bridge of the Chicago, St. Paul, Minneapolis & Omaha road across the Mississippi River at St. Paul is finished. It has six spans, 150 ft. each, and was built by the Keystone Bridge Co., of Pittsburgh, Pa.

The Canadian Pacific has recently completed on its Western division a 470 ft. iron through truss bridge over the Bow River near Kananaskas Station. Also two wooden Howe truss bridges over the Bow River, each having two spans 120 ft. each. There have also been completed three wooden Howe truss bridges over the Devil's Head Creek, and one over the north arm of the Bow River near Laggan Station.

The Union Bridge Co. is building a one span 150-ft. iron through truss bridge, with stone abutments, over the Big Darley River at Milford, O., for the Cleveland, Columbus, Cincinnati & Indianapolis.

Cofrode & Saylor, of Philadelphia, Pa., have lately completed for the Central of New Jersey three draw-bridges on the Perth Amboy branch, and iron street bridges at Roselle and Westfield, and street bridges on the Newark & New York road. They have also erected a three-span iron bridge over the Lehigh River at Coplay.

The Kansas City & Memphis Railway & Bridge Co. has submitted plans to the Secretary of War for the proposed bridge across the Mississippi River at Memphis, and a board of engineer officers has been appointed to consider the plans.

A board of engineers will meet in Louisville May 30 to consider the plans of the bridge to be built over the Ohio River, between Louisville and Jeffersonville.

The Phœnix Bridge Co., of Phœnixville, Pa., is erecting an iron bridge at Wheeler's Lock, one mile north of Allentown, Pa., for the Central of New Jersey.

The New Jersey Steel & Iron Co., of Trenton, N. J., is erecting new draw-bridges on Hackensack and Passaic rivers for the Newark & New York road.

A number of iron bridges will be erected on the Long Island road during the summer.

The contract for the extension of the car platform of the New York & Brooklyn Bridge from Nassau and Concord streets, in Brooklyn, has been awarded to the Passaic Rolling Mill Co., at $50,000. The contract for the iron work to be used on the Barnes-Martin extension of the bridge has been awarded to the New Jersey Steel & Iron Works for $25,000.

It is reported that the County Commissioners will erect a bridge at Sudbury, Pa.

The County Clerk of Coming County, Neb., will receive bids until June 4 for constructing two iron bridges.

It is reported that the County Commissioners will erect a bridge at Snydertown, Pa.

The County Clerk of Leavenworth, Kan., will receive bids until June 4 for the erection of four bridges near that place.

The contract for the construction of the bridge over Sixth street, in Philadelphia, Pa., has been let to W. H. Brown, at $12,500.

The Milwaukee Bridge & Iron Works has been awarded the contract for erecting a bridge in Juneau Park, Milwaukee, Wis.

Manufacturing and Business.

The business of the Ingersoll Rock Drill Co. has been brisk and increasing since the beginning of spring. They have recently made several foreign shipments of air compressors, drills, etc., comprising a plant to China, one to Liverpool, two to Mexico and one to South America; and have now under way a complete plant for the Pacific coast of Mexico, to be transported on muleback, compressors, receiver and all heavy machinery being cut up into sections. For railroad work they have recently taken orders from the Norfolk & Western, New York Central and Philadelphia & Reading, and they have shipped an air compressor plant to contractors on the Cumberland Gap tunnel in southern Tennessee. In mining they have orders for air compressors, drills, etc., from Cooper, Hewitt & Co., the King Iron Ore Co., the Bessemer Iron Co. and the New Jersey Iron Mining Co., and have just sold six "Sergeant" drills (making 12 in all recently sold) to the Minnesota iron mines in Minnesota.

The Dunham Manufacturing Co. report numerous inquiries for the Servis tie plate and have orders the past week from the Pullman Car Co., for their well known Dunham car door for the "Soo" line, also for 600 from the Lafayette Car Co. and 400 from the Burton Stock Car Co. to go to the new Wichita shops, besides order from the Carlisle Manufacturing Co., the Boston & Albany and Fitchburg.

The Indianapolis Car Works have contracted with a Southern lumber firm to supply them with 7,000,000 ft. of yellow pine, to be delivered at the rate of six cars per day for the next five months.

The Railway Claim Adjustment Co., of Chicago, has been incorporated, with a capital stock of $50,000, for the adjustment of claims against railroad companies. Charles M. Cook, William O. Johnson and others are the incorporators

Riehle Bros., proprietors of the Philadelphia Scale & Testing Machine Works, report the following recent orders among others: Four 30-ton platform scales for Phœnix Iron Co.; one 12,000-pound rolling mill scale, for Catasauqua Manufacturing Co.; one 6,000-pound scale and one 5000-pound foundry testing machine for Houston Car Wheel Co., Houston, Texas.; one furnace charging scale, for the Warren Furnace Co., Hacketstown, N. J.; two furnace charging scales for the Thomas Iron Co., Hellertown, Pa.; one railroad track scale for the Lebanon Rolling Mills, Lebanon, Pa.

The Cleveland Frog & Crossing Co., of Cleveland, O., has been incorporated with a capital stock of $100,000, by N. P. Bowler and others.

The new boat being built for the Central of New Jersey at Philadelphia to run between New York and Sandy Hook, is being fitted with an Edison electric lighting plant of 250 lights, and the two large ferryboats being built at Baltimore for the Baltimore & Ohio are also being fitted with duplicate electric light plants.

The American Fireproof Steel-Car Co., of Chicago, has been incorporated, with a capital of $1,500,000, for the manufacture of cars and rolling stock, by William W. Green and others.

The Brainard Indestructible White Iron Paint Co., of Chicago, is making a paint which is said to be produced by an entirely new process from white iron. They make various railroad and fireproof paints. The office of the company is Leland Hotel, Chicago.

The old and well-known book publishing and importing house of E. & F. N. Spon has removed from 35 Murray street to more convenient quarters at 12 Cortlandt street, New York City.

The Gates Iron Works, of Chicago, Ill., is making a rock breaker, for the Cambria Iron Co., of Johnstown, Pa., which will weigh 35 tons and is stated to be the largest ever made. The capacity of the machine will be 125 tons of rock per hour. Three openings will be provided for the admission of rock, each of which will be 18×18×45 in., it will be used for crushing flux for the Cambria Iron Co.'s blast furnace.

The board of directors of the Burton Stock Car Co. has been reorganized by the election of the following directors: J. C. Moore, Manchester, N. H.; Ezra H. Winchester, Frank Jones, Portsmouth, N. H.; J. O. Davidson, of Wichita, Kan.; Charles A. Sinclair, of Portsmouth, N. H.; James P. Cook, of Salem; Edward Spalding, Virgil C. Gilman, Nashua, N. H.; C. F. Adams, Boston; George D. Burton, of New Ipswich, N. H.; W. S. Reed, of Leominster, Mass., and M. V. Livingston, of Boston.

Iron and Steel.

Seaman, Sleeth & Black, of the Phœnix Roll Works, at Pittsburgh, are engaged in making four large rolls, each of which will weigh 32 tons, to be shipped to the South Chicago Rolling Mill Co.

The Pottsville Steel & Iron Co., Pottsville, Pa., has reduced the wages of its employés 10 per cent.

The Muncie Forge & Iron Co. has been incorporated at Muncie, Ind., with a paid-up capital stock of $50,000. John H. Carter and Charles T. Dickson, of Cincinnati, are interested in the company.

Carnegie, Phipps & Co. have contracted to furnish the rails for the New Castle & Shenango Valley road, and they will be rolled at the Edgar Thomson Steel Works at Braddock, Pa. Thomas Jones has lately been appointed Assistant Superintendent of these works.

The large iron and machine works of the Belmont Iron Co., Philadelphia, were destroyed by fire May 22, causing a loss of $60,000 on the building and machinery and $10,000 on the stock. The insurance nearly covers the loss.

The Wayne Iron & Steel Works, of Pittsburgh, Pa., have posted a notice that a reduction in wages of 10 per cent. will be made when the mill resumes. An advance of 10 per cent. was made a year ago, but the company has concluded to take off what was added at that time on account of the present depression in the trade. If the men decide to accept the reduction the mill will resume operations at once.

It has been decided to increase the capital stock of the Henderson Steel & Manufacturing Co., of Birmingham, Ala., to $1,000,000, and erect a large plant for steel making.

Car Heating Notes.

The Grand Rapids & Indiana has been testing the McElroy method of heating trains by steam, with good results.

The Rail Market.

Steel Rails.—The only order accessible to Eastern mills reported is an 8,000 ton lot for delivery in Alabama. But few sales are reported, and the market continues dull and weak.

Old Rails.—Sales of about 25,000 tons of tees at $20@$20.50 have been made in the Eastern market.

Rail Fastenings.—Quotations: Spikes, $1.90 at mill or $2.05 delivered; fish plates, 1.85@1.90c.

Canal Boats Drawn by Locomotives.

The London & Northwestern (England) own the Shropshire Union Canal, and are about to try locomotives to draw the canal boats instead of horses. Several small engines to run on rails alongside of the canal are being built at Crewe. The experiment will be made between Chester and Shrewsbury.

Extension of the Use of the Westinghouse Brake.

The great success of the Westinghouse brake has led to its general adoption on the London, Chatham & Dover Railway in this country, and also on the Gothard Railway in Switzerland, on which line a vacuum brake has hitherto been used. The general tendency on the Continent is towards the use of air-pressure brakes in preference to vacuum brakes.—*Engineering.*

A New Petroleum Field.

A committee of the Dominion Parliament, reporting on the resources of the valleys of the Mackenzie and Athabaska rivers, state that the extent of the region is 1,260,000 square miles; that on the Arctic Ocean and Hudson Bay it has 5,000 miles of coast line, one-half of which is open to whaling and sealing craft; and there is 4,000 miles of navigable coast on the larger lakes, and 2,750 miles of river navigation.

This country, the southern boundary of which is about the fifty-fourth parallel, is, it will be noticed, slightly north of Jay Cook's at one time famous banana belt. But the report states that 656,000 square miles are fit for potato growing, 407,000 for barley, 316,000 for wheat, 800,000 for stock raising, and 150,000 square miles are auriferous. But the most valuable resource of the country lies in petroleum fields which visibly extend along the Athabska for 150 miles, and are supposed to extend as far south as Lac la Biche. The Athabaska River is navigable for steamboats from the Hudson Bay Company's Athabaska landing 125 miles to Grand Rapids. From that place to McMurray, 80 miles, it is not navigable. The Athabaska landing is 90 miles by wagon road from Edmondton, at the head of navigation on the north Saskatchewan.

The presence of a large field of petroleum north of the Grand Rapids, and thus within marketable distance, is noted by *Engineering* (London), which, in a recent issue, says: "If England, with Burmah and Canada combined, cannot 'strike oil' and make herself a petroleum power like Russia and America, she will only have herself to blame in the matter." But the Standard Oil Co. may have something to say.

A railroad is now under construction from Regina along the Lost Mountain Lake towards the settlements around the junction of the North and South Saskatchewan rivers, but the most direct railroad connection would be from the neighborhood of Calgary, which is about 200 miles south of Edmonton.

Petroleum Gas on a Locomotive.

An apparatus for burning the gas from the distillation of petroleum is being tried on a locomotive on the Pittsburgh & Lake Erie. A tank holding 162 gallons of petroleum is placed on the tender, and the petroleum runs by gravity into the retort, which is also placed on the tender, and the gas is fed into the fire-box by a small steam injector. It is said that steam is easily raised and maintained. This method is the invention of Mr. William Smith, of Pittsburgh.

Track Tanks in the West.

Track tanks for supplying water to the locomotives while running have been laid down at Wadsworth, on the Chicago, Milwaukee & St. Paul. These tanks have been in use on the Pennsylvania and New York Central for some years. Ten new passenger locomotives on the St. Paul road are equipped with scoops for picking up the water, and it is said that the time between Chicago and Milwaukee will be reduced to 2 hours 15 minutes, the number of stoppages being two instead of three, as at present.

The Vestibule Patent Case.

The vestibule train case was again brought before Judges Gresham and Blodgett in the United States Circuit Court in Chicago on May 21, on a motion to modify the injunction restraining the Wagner Palace Car Co. from infringing the Sessions patent for vestibuled trains owned by the Pullman Palace Car Co., by substituting therefor a bond for damages. Counsel for the Wagner Co. thought the Court had misconceived some matters and misconstrued others. Mr. Payson said he had no doubt but the Court had forgotten one of the most important points, which was that the chief claim of the Sessions patent was to prevent oscillation. The English patents of Garvey, Dyer and Chidley all covered this identical point, whereas the Court had declared that none of the prior patents had embraced this feature. Sessions had appropriated his device from Garvey and Chidley.

Counsel next objected to the Sessions patent being fatally defective in not showing how powerful the springs should be and in not showing definitely what his patent was for. The present application would, he admitted, constitute a rehearing of the case, partly on newly-found evidence. This was contained in the affidavits of witnesses as to the use of the invention then under the name of the Michigan Central canopies, with top spiral springs and a pressure of about 75 pounds to each spring. An affidavit was read from a master mechanic of the Chicago, Burlington & Quincy that these canopies were used by the Burlington from 1868 to 1877. The affidavits of several experts on patent matters were read. Melville E. Fuller testified that the various points in the Sessions patent were covered by the prior patents. Mr. B. Thurston, for the Pullman Co., argued that all the points made by counsel for the Wagner Co. had been fully discussed in the first hearing, and were referred to in the briefs. Since the injunction had been issued the Wagner Co., he said, had manufactured for the Chicago & Northwestern a fully-equipped vestibule train in direct violation of the injunction. The only change in that train or in the Wagner trains had been a spring of reduced strength. The objectionable features had been, however, retained. If the present motion was denied, the Pullman Co. would, he said, ask for an attachment for contempt. The Court took the matter under advisement.

THE SCRAP HEAP.

A Prompt Settlement.

A dispatch to the Kansas City *Times* of May 19 says that "an agent of the Atchison, Topeka & Santa Fe to-day adjusted all losses at the town of Fountain caused by last Monday's explosion, though the coroner's jury had exonerated the company from all blame. A committee was appointed to estimate the damages and the agent paid them. The citizens adopted resolutions thanking the road for the unexpected and unprecedented action, and also thanking the people of Colorado Springs for their contributions."

A Singular Verdict.

Exploding torpedoes is not an unusual way of expressing good wishes, but it may have somewhat unexpected results, as was exhibited recently when that method was adopted on an English railroad on the occasion of the marriage of a lady and gentlemen who were starting by train on their honeymoon. The fog-signals frightened two horses, which knocked down, ran over, and killed a man. The jury at the inquest added a recommendation to their verdict "That the Great Western Railway Co. should be informed that fog-signals ought not to be used for wedding purposes." It would be interesting to know whether this jury would consider green or red lanterns the more suitable for divorce purposes.

Car Works at Anniston.

The new works of the United States Rolling Stock Co. at Anniston were commenced by the purchase of the Anniston car wheel and axle works, and the forge and rolling mill, all owned by Messrs. Noble Bros. & Co., and the car works of the Alabama Manufacturing Co.

The following improvements, according to the *Manufacturer's Record*, are being made: A new foundry 130 ft. × 84 ft., the axle forge doubled in capacity, a machine and blacksmith shop 825 ft. × 105 ft., paint shop 325 ft. × 96 ft., car repairing shop 500 ft. × 96 ft.

The wood working shop which is arranged to take the rough lumber in at one end and turn out from 20 to 25 cars daily from the other, is 1,000×105; this building is fitted with woodworking machinery from Fay & Co., of Cincinnati, O., and with engines of 500 horse-power. The blacksmith shop has 225 horse-power engines and machinery sup-

plied by Bement, Miles & Co. A new rolling mill to roll 40 tons a day is to be constructed. The works when in full operation will employ 1,000 mechanics.

The Mississipi Flood.

The inundation of the Mississippi River bottoms in the region of Quincy, Ill., increased steadily until about May 21. The levees have been broken in many places, and the water, which has spread over a territory in many places 5 and 10 miles wide, is higher than at any time since 1851. The city of Quincy has been cut off from communication north, west and south. The track between that place and Carthage was under water for a distance of several miles. Many bridges were carried away and telegraph lines destroyed. Reports state that 85 miles of the St. Louis, Keokuk & Northwestern track was overflowed and damaged. The Keokuk & Western, the Chicago, Burlington & Quincy and other roads are badly damaged. The total damage to property will probably exceed $3,000,000.

Notes.

Gov. Hill, of New York, has approved the bill providing for the elevation of the tracks of the principal roads entering Buffalo, according to the plans which have been prepared looking to the elimination of a number of grade crossings, and the erection of a new union passenger station.

Senator Blair, of New Hampshire, has introduced in Congress a bill to prohibit secular work and business on Sunday in all territory subject to the exclusive jurisdiction of the United States. The bill includes a section prohibiting the regular transmission of mails over any land postal route on Sunday, and one making it unlawful to carry on commerce between the states on that day. Exceptions are made in the case of accidents, disasters and unavoidable delays, and to provide for the transportation of perishable property under restrictions.

A collision on the Moscow & Kursk Railroad, Russia, May 15, killed 11 and injured 13 people.

The new union passenger depot at Indianapolis, Ind., is expected to be completed by Sept. 1. The main building is three stories high, and is 150 ft. long by 150 ft. wide. There is also a clock tower 185 ft. high. The train shed will be 180 × 750 ft., and there will be 1.52 miles of track under it.

How a "Religious Weekly" does it.

The following "reading notice" is from a recent issue of the *National Baptist* of Philadelphia: At Bradford the latest windfall is the fact that one of our good brethren has secured a patent for the Luce Automatic Car Brake, which is destined to revolutionize* the entire car-brake system* in the country. By it the force of the brain† (*sic*) sets the brake automatically on every car on any run away section of train going in any direction, and that almost* instantly. It will run a train from sea to sea without a brakeman, and the whole mechanism is of the simplest* order, and to see the model is to acknowledge the truth of the above statements. It is the marvel of this age,* and imperatively demanded† in these times of awful wrecks. We rejoice in the coming fortune to this strong Baptist brother, who has a heart to give, as well as to make, money.

[* Expressions idiomatic to "press-notices" of inventions.
† As Cox said to Butterfield, the idea is "remote;" but the intelligent reader will catch on. "Brain" is, however, perhaps a misprint for "train."—Ed.]

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Railroad and Technical Conventions.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The American Society of Civil Engineers will hold its annual convention in Milwaukee, Wis., the last week of June.

The *Ohio Institute of Mining Engineers* will hold its summer meeting at Logan, O., commencing July 11.

The *International Association of Car Accountants* will hold its annual meeting in Montreal, Can., June 19.

The *American Institute of Mining Engineers* will hold its fifty-first meeting at Birmingham, Ala., commencing May 15.

The *American Train Dispatchers' Association* will hold its fifth annual meeting at Louisville, Ky., June 12.

The *National Association of General Passenger and Ticket Agents* will hold its fall meeting in Saratoga, N. Y., Sept. 18.

The *National Association of General Baggage Agents* will hold its next meeting in New York City July 18.

The *Master Car-Builders' Association*, annual convention, Alexandria Bay, N. Y., commencing June 12.

The *American Railway Master Mechanics' Association*, next annual convention, Thousand Islands, N. Y., June 19.

The *New England Railroad Club* meets at its rooms in the Boston & Albany passenger station, Boston, on the second Wednesday of each month.

The *New York Railroad Club* meets at its rooms, 113 Liberty street, New York City, on the third Thursday of each month.

The *Western Railway Club* meets in Chicago the third Wednesday in each month.

The *Central Railway Club* meets at the Tifft House, Buffalo, the fourth Wednesday of January, March, May, August and October.

The *American Society of Civil Engineers* holds meetings on the first and third Wednesday in each month at the House of the Society, 127 East Twenty-third street, N. Y.

The *Boston Society of Civil Engineers* holds its regular monthly meetings at its rooms in the Boston & Albany station, Boston, at 7:30 p. m. on the third Wednesday of each month.

The *Western Society of Engineers* holds its regular meetings at its hall, No. 15 Washington street, Chicago, at 7:30 p. m., on the first Tuesday of each month.

The *Engineers' Club of St. Louis* meets the first and third Wednesday of each month till June.

The *Engineers' Society of Western Pennsylvania* meets in Pittsburgh the third Tuesday of each month.

Missouri Association of Surveyors and Civil Engineers will hold its annual meeting at Columbia, Mo., commencing May 31.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Brooklyn & Montauk, special meeting, 120 Broadway, New York, June 11.

Canada Southern, annual meeting, St. Thomas, Ont., June 6.

Chicago & Eastern Illinois, annual meeting, Chicago, Ill., June 6.

Chicago, Milwaukee & St. Paul, annual meeting, Milwaukee, Wis., June 2.

Chicago & Northwestern, annual meeting, at the office in Chicago, Ill., June 7.

Chicago, Rock Island & Pacific, annual meeting, Chicago, Ill., June 6.

Chicago, St. Paul, Minneapolis & Omaha, annual meeting, Hudson, Wis., June 9.

Des Moines & Fort Dodge, annual meeting, Des Moines, Ia., June 7.

Middletown, Unionville & Water Gap, annual meeting, 15 Cortlandt street, New York City, May 28.

Milwaukee, Lake Shore & Western, annual meeting, Milwaukee, Wis., June 13.

Oregon & Transcontinental, annual meeting, Portland, Or., June 18.

Pittsburgh, Fort Wayne & Chicago, annual meeting, Pittsburgh, Pa., May 16; special meeting, June 13.

Richmond & Danville, special meeting, Richmond, Va., May 21.

St. Joseph & Grand Island, annual meeting, Elwood, Kan., June 12.

St. Louis Alton & Terre Haute, annual meeting St. Louis, Mo., June 4.

St. Paul & Duluth, annual meeting, St. Paul, Minn., June 18.

Toledo, St. Louis & Kansas City, annual meeting, Toledo, O., June 13.

Iron and Steel Institute of Great Britain.

The annual meeting of this body will be held in the United States in 1889. It had been arranged that the meeting should be held in this country in the fall of 1888, and 300 members signified their intention of attending, but American members suggested that the meeting should be deferred until after the Presidential election.

New England Water-works Association.

The seventh annual convention will be held at Providence, R. I., June 13, 14 and 15, 1888. The headquarters of the Association during the convention will be at the Narragansett Hotel. All those proposing to attend are requested to promptly notify Edwin Darling, President N. E. W. W. Association, Pawtucket, R. I., of such intention. The hotel accommodations will be of that magnitude which will allow for the attractive entertainment of the lady friends of the Association, and it is urged upon the members to see that a large representation is present during the convention. Members of Water Boards and all others interested in questions pertaining to water supply are always welcomed to the meetings of this Association. A cordial invitation is hereby extended to all those persons who are eligible, and have not already done so, to join the Association.

The Master Car-Builders' and Master Mechanics' Conventions.

Arrangements will be made with the New York, Ontario & Western and Rome, Watertown & Ogdensburg to run a special train composed jointly of their handsomest parlor chair cars, coaches with Forney's improved seat and Pullman parlor cars for the accommodation of members of the two associations, supply men, their families and friends attending the June conventions.

Route is via New York, Ontario & Western, and the Utica & Black River division of Rome, Watertown & Ogdensburg to Clayton, thence by steamer St. Lawrence to Alexandria Bay. The train will leave Forty-second Street Ferry at 9 a. m., Jay Street Ferry at 8:45 a. m. on Monday, June 11. Excursion tickets will be sold at rate of $11.70 from New York for round trip, including steamer both ways, made good to return by any of the regular trains up to June 26.

Engineers' Club of St. Louis.

A regular meeting was held May 16. Col. E. D. Meier was elected Vice-President. The last meeting of the spring session will be held May 30. W. T. Gould was elected a member.

C. F. White read a paper on the "Failure of a Firmenich Boiler in the Plant Flour Mills, St. Louis." The construction of the boiler and the arrangement of the plant were described. The material was C. H. No. 1 iron, 45,000 lbs. tensile strength. In the opinion of the writer the failure was due to faulty design, which permitted great difference of temperature and consequent expansion of adjoining tubes. Comparisons were made with other water tube boilers, and several members took part in the discussion.

Louis Stockett read a paper on "A Well Ventilated Mine," describing in detail the arrangement of mine No. 6, at Staunton, Ill.

The committee to which was referred the matter of proposed legislation on National Public Works reported that in its opinion the legislation proposed in the Cullom-Breckenridge bills is a step in the right direction. The committee recommends the appointment of two committees of the club, one of which shall be charged with the duty of raising funds to help the movement by private subscription; the other committee to be instructed to correspond with similar committees from other clubs, and with other people interested in the proposed legislation. The committee is of the opinion that promotions from grade of Division Engineer to that of Department Engineer should be subject to the recommendation of an examining board, as provided for other grades. The report was adopted.

Engineers' Club of Philadelphia.

Regular meeting, May 5, 1888: President Joseph M. Wilson in the chair.

The secretary presented, for Mr. Oscar Sanne, an illustrated description of a Rolling Bridge for Docks. The author says:

"During my stay with the Dominion Bridge Co., I was called upon to make a design for a rolling bridge. This structure was to be used at the government's dock at Quebec.

"The accompanying blue prints shows the details in such a clear and complete manner that there does not remain much for me to explain.

"In regard to the form of the truss I like to say that I consider it a very economical one and use it myself exclusively in draw spans, wherever I have a chance. It also adds very favorably to the appearance of the structure.

"In comparing the design with another one for the same purpose where plate girders were used, I found a saving of weight in favor of my design of about 75,000 lbs.

"The estimated weights were found to be as follows:

	Lbs.
Trusses and connection	66,946
Machinery and shafting	2,940
" " castings	12,019
" " brass	394
Counterweight and I beam support	69,500
Track	87,645
Total	239,444

"The bridge has to be moved back the full width of the channel, which is 69 ft. 5 in. The machinery is designed to open it in 2 minutes 54 seconds. Before bridge is started the apron has to be lifted, thus helping considerable for counterbalance. The details of the machinery show worm gearing; this does not seem the most economical arrangement, but the little space which was given to fit the machinery into made this arrangement necessary.

"All shapes are of steel, eyebars and rods of iron.

"This structure is to be built this spring and I hope will prove a success."

PERSONAL.

—E. M. Moore has resigned his position as General Freight Agent of the Rome, Watertown & Ogdensburg.

—Mr. R. H. Soule, the late General Manager of the New York, Lake Erie & Western, sailed for Europe last Saturday on the "Servia."

—Commissioner Albert Fink has gone to Louisville, Ky., for a short visit, and will, it is said, soon sail for Europe, to be gone three months.

—Col. D. C. Dodge, Vice-President and General Manager of the Mexican National Railroad, has resigned to devote himself to his private interests.

—H. C. Ives, Assistant General Manager of the St. Paul, Minneapolis & Manitoba, has tendered his resignation, to take effect June 1. He has held this position since February, 1885, and has been connected with the road since 1879.

—At the annual meeting of the stockholders of the Colorado Midland in Colorado Springs this week, J. J. Hagerman tendered his resignation as President of the road, on account of ill health. He still continues to be a director of the road.

—Draw-keeper Harford, who has tended the Norwalk drawbridge of the New York, New Haven & Hartford for about forty years, will be inclined to think that lightning does sometimes strike twice in the same place. He was on duty there on May 6, 1853, when a careless engineer plunged his train into the river, killing 46 people; and last week (May 18) he saw another train load come within about ten inches of a similar fate.

—L. W. Buckmaster, Superintendent of the Ohio Division of the Cincinnati, Jackson & Mackinaw, has tendered his resignation, taking effect May 21. In 1864 he became connected with the Central Ohio, now part of the Baltimore & Ohio, with which road he remained until 1885, when he was appointed Superintendent of Transportation of the Cincinnati, Jackson & Mackinaw.

—William M. Greene, who has been assistant to the President of the Cincinnati, Indianapolis, St. Louis & Chicago, since September, 1887, has been appointed General Manager. Mr. Greene is 30 years old, 10 of which have been spent in the railroad service. He was first connected with the Columbus, Hocking Valley & Toledo, with which road he remained until his appointment as Assistant to the President of the road, of which he has just been made General Manager. He is a son of M. M. Greene, the founder of the Columbus, Hocking Valley & Toledo.

—George M. Phelps, the well-known inventor, died on May 18 at his home in Brooklyn, N. Y., of paralysis, in the sixty-ninth year of his age. Mr. Phelps in early life became a mathematical instrument maker, but later became a manufacturer of light machinery. Soon after the establishment of the telegraph by Professor Morse he entered into the invention and manufacture of telegraph instruments, and was for a great many years at the head of the manufacturing department of the American and Western Union Telegraph companies. The Phelps electromotor printer, in use on the lines of the Western Union, is the most important of his inventions. His son, G. M. Phelps, Jr., is associate editor of *The Electrical Engineer*.

ELECTIONS AND APPOINTMENTS.

Atlantic, Birmingham & Kansas City.—H. M. Herman, of New York, is President of this new Georgia company, and W. J. Weeks, Talbotton, Ga., is Vice-President.

American Association of Railway Chemists.—At the annual meeting in Cleveland, O., May 14, the following officers were elected: President, W. D. Gregory; Vice-President, L. W. Brown; Secretary and Treasurer, G. M. Davidson.

Ashland Coal & Iron Railway Co.—At the annual meeting in Ashland, Ky., May 16, the following directors were chosen: John Means, Douglas Putnam, Jr., Ashland, Ky.; George N. Biggs, Huntington, W. Va.; A. S. Winslow, Cincinnati, O.; John G. Peebles, Portsmouth, O.; James M. Bailey, Pittsburgh, Pa. The board elected John Means President; John G. Peebles, Vice-President; Douglas Putnam, Jr., Superintendent; Robert Peebles, Secretary and Treasurer.

Carolina Central.—D. W. Oates, of Charlotte, N. C.; Isaac Bates, of Wilmington, N. C.; R. S. Tucker and J. C. Winder, of Raleigh, N. C.; John M. Robinson, R. C. Hoffman, J. S. Whidbee and J. L. Minis, of Baltimore; W. W. Chamberlain, of Norfolk, Va., and C. H. Roberts and C. Goddard, of New York, were chosen directors at the annual meeting of the stockholders.

Chattanooga, Rome & Columbus.—George D. Lawrence has been appointed Superintendent, with office in Rome, Ga.

Chesapeake & Ohio.—W. M. Garstang has been appointed Master Mechanic.

Cincinnati, Indianapolis, St. Louis & Chicago.—W. M. Greene has been appointed General Manager, with office in Cincinnati, Ohio.

Cleveland, Columbus, Cincinnati & Indianapolis.—T. A. Laws has been appointed Master Mechanic of the Indianapolis and Illinois & St. Louis division, with headquarters at Brightwood, Ind., vice W. Garstang, resigned.

Colorado Midland.—At the annual meeting held at Colorado Springs, May 22, the following Board of Directors was chosen for the ensuing year: J. J. Hagerman, J. A. Hayes, Jr., and H. T. Rogers, Colorado Springs; J. R. Buske, S. S. Sands, W. D. Sloane, T. E. Jevons, G. C. Allen, F. F. Thompson and Gordon Norrie, of York; T. L. Davis, of Newport, R. I.

Detroit & St. Clair River.—The old board of directors were re-elected at a meeting held in St. Clair, Mich., last week.

Denver & Rio Grande.—At the annual meeting held in Denver, May 22, the following directors were elected: George Coppell, Robert B. Minturn, Adolph Engler and Richard T. Wilson, New York; John L. L. Welch and John J. Stadiger, Philadelphia; David H. Moffatt, Walter S. Cheemany and Joseph M. Gilluhin, Denver.

Denver & Santa Fe.—At the annual meeting in Denver, Col., May 16, the following directors were elected: W. B. Strong, J. T. Burr, B. P. Cheney, A. W. Nickerson, of Boston; C. C. Welch, of Golden; E. F. Bishop, T. C. Henry, C. L. McIntosh, C. B. Kountze, Donald Fletcher, Philip Feldhauser, R. W. Woodbury, of Denver; B. F. Crowell, of Colorado Springs. Officers: W. B. Strong, President; C. W. Smith, of Boston, First Vice-President; A. A. Robinson, of Topeka, Second Vice-President; J. F. Goddard, of Chicago, Third Vice-President.

Flint & Pere Marquette.—At the annual election in Detroit this week the following directors were elected unanimously: W. W. Crapo, L. Snow, New Bedford, Mass.; Lewis Pierce, Portland, Me.; Alfred M. Hoyt, George Coppell, New York; J. W. Mackintosh, F. V. Parker, J. Lewis Stackpole, Boston, Mass.; H. C. Potter, W. L. Webber, H. C. Potter, Jr., East Saginaw, Mich. At a meeting of the directors the following officers were chosen: President, William W. Crapo; Vice-President and General Manager, Henry C. Potter; Secretary and Treasurer, H. C. Potter, Jr.

Gardner, Coal City & Northern.—The first board of directors of this Illinois company is as follows: Arthur J. Caton, Russell Whitman, Arthur F. Towne, Charles E. Towne and Arthur D. Wheeler, of Chicago.

Galveston, Sabine & St. Louis.—The officers of the reorganized company are: N. H. Easton, New York, President; R. J. Evans, Longview, Vice-President and General Manager; Edwin L. Larchar and Frank M. Larchar, New York; Charles M. Whitney, New Orleans, La.; J. M. Mobberly, Longview, Ga., and Thomas F. Hull, Carthage, directors; S. E. Eckles, Chief Engineer, and Charles W. Booth, General Passenger and Freight Agent.

Indianapolis, Chattanooga & Southern.—F. L. Patrick, Columbus, Ohio, is one of the projectors of this newly incorporated Indiana company.

Inverness & Richmond.—At the annual meeting held at Port Hood, C. B., May 15, the following officers and directors were elected: Edward P. Ward, President; Wm. Linn Allen, Secretary; Frank B. Allen, Managing Director; Richard B. Mellon, Pittsburgh; Samuel Macdonnell, Port Hood; Lewis McKeen, Mabou; and George C. Lawrence, Hastings.

Iowa Central.—The following are the incorporators of this Illinois company, organized to take the place of the Central Iowa: A. B. Stickney, Ansel Oppenheim and C. W. Bunn, of St. Paul; M. C. Woodruff, of Dubuque, Ia., and W. A. Gardner, R. D. McFadon, W. A. Lamson, R. E. Beebe and H. A. Gardner, of Chicago, Ill.

Kentucky Union.—At the annual meeting in Louisville, Ky., this week, F. S. Carley was re-elected President.

Kentucky Railroad Commission.—The following have been appointed Commissioners by Gov. Buckner: Ignatius A. Spaulding, W. B. Fleming and John T. Hager.

Louisville Southern.—Bennett H. Young has been elected President, with office in Louisville, Ky., vice J. W. Stine, resigned.

Mobile & Birmingham.—At the annual meeting at Mobile, Ala., the following directors were elected: Calvin S. Brice, George S. Scott, E. R. Bacon, T. M. Logan, Edward Lauterbach, George F. Stone, John Greenough, E. R. Chapman, of New York, and T. G. Bush and D. T. Parker, of Alabama. The directors organized by electing T. G. Bush, President; Edward R. Bacon, Vice-President; Frank Walsh, Secretary, and W. A. C. Ewen, Treasurer.

Nashville & Knoxville.—The following officers have been elected for the ensuing year: A. J. Crawford, President; A. Vandivort, Vice-President and Assistant Manager; A. L. Crawford, General Manager and Treasurer; J. A. Crawford, Assistant Treasurer and Secretary; C. J. Allison, Chief Engineer. The general office is in Lebanon, Tenn.

Northern Maine.—The directors of this company are as follows: Lewellyn Powers, Houlton, Me.; Henry C. Sharp, Monticello; George H. Freeman, Joseph B. Hall and James W. Bolton, Presque Isle; George P. Wescott, Portland, and A. F. Luckett, Rockland. The officers are: President, George P. Wescott; Vice-President, Joseph B. Hall; Treasurer, A. H. Burleigh, Presque Isle; A. C. Perry, Presque Isle.

New York, Lake Erie & Western.—At a meeting of the directors in New York this week, S. M. Felton was elected a director to fill the vacancy caused by the death of Wm. B. Dinsmore.

Henry T. Ellis has been appointed master mechanic on the Susquehanna Division.

Omaha & St. Louis.—James H. Smith, John H. Beach, George Warren Smith, James F. Dwight, Henry W. Eaton and Edward W. Sheldon have been elected directors.

Pomona & Elsinore.—The following are the officers of this California company: Samuel Merril, President; Richard Gird, Chino, Cal., Vice-President; H. A. Palmer, Pomona, Secretary; John B. Treadwell, Chino, Chief Engineer.

Pittsburgh, Youngstown & Ashtabula.—The following directors were elected at the annual meeting in Youngstown, O., May 17: John N. Hutchinson, George B. Roberts, Philadelphia; J. N. McCullough, William Shaw, Thomas D. Messler, William Mullins, of Pittsburgh; Caleb B. Wick, W. Scott Bonnell, J. G. Butler, Jr., Youngstown; H. L. Morrison, Amos C. Fisk, Ashtabula. The directors elected J. N. Hutchinson, President; John E. Davidson, Treasurer; Frank Semple, Secretary.

Pueblo & Arkansas Valley.—The following directors were elected at the annual meeting in Pueblo, Col.: W. B. Strong, B. P. Cheney, G. L. Goodwin, J. W. Nickerson, Alden Speare, J. P. Whitehead, J. T. Burr, H. M. Burr, of Boston; M. D. Thatcher and O. H. P. Baxter, of Pueblo; James Clelland, E. T. Alling, Cañon City; E. Wilder, of Topeka. The directors elected the following officers: President, W. B. Strong; First Vice-President, C. W. Smith; Second Vice-President and Manager, A. A. Robinson; Third Vice-President, J. F. Goddard; Secretary and Treasurer, M. D. Thatcher.

Salt Lake & Fort Douglas.—W. W. Mackintosh has been appointed general freight and passenger agent, with office in Salt Lake City.

San Diego & Elsinore.—The officers of this company are as follows: President, Richard Gird, Chino, Cal.; Vice-President, M. A. Luce, San Diego; Treasurer, Bryant Howard, San Diego; Chief Engineer, John B. Treadwell, Chino, Cal.

St. Paul & Minneapolis Elevated.—The following are the incorporators of this company: E. N. Saunders, A. H. Wilder, E. A. Seymour, William Dawson, Jr., John H. Ames, of St. Paul; and John De Laittre, J. F. R. Rose, C. E. Wales and Henry Sidle, of Minneapolis.

Spokane Falls & Northern.—The directors of this new road have elected the following officers: A. A. Newbery, President; W. H. Taylor, Vice-President; J. N. Glover, Treasurer; T. E. Jefferson, Secretary, all of Spokane Falls, W. T.

Toledo, Columbus & Southern.—Henry A. Cooper has been appointed General Superintendent, with headquarters in Toledo, Ohio.

Utica, Adirondack & Saratoga.—The following are the officers of this company: H. J. Cookinham, President, Utica, N. Y.; Edward Norris, Vice-President, Utica; W. P. Dodge, Secretary, Prospect, N. Y.; J. F. Mann, Treasurer, Utica; R. W. Sherman, Chief Engineer, Utica.

OLD AND NEW ROADS.

Aberdeen, Sioux Falls & Montana.—The engineers are now surveying an entrance for the line into Sioux Falls, Dak. R. E. Kirk, Aberdeen, Dak., is Chief Engineer.

Baltimore & Ohio.—The subscription books of the $7,500,000 new consolidated mortgage bonds were opened in London and New York May 21, but owing to the difference in time the whole issue was subscribed in London before the American subscribers were enabled to secure any. It is announced, however, that the subscriptions in both cities will be treated alike, without regard to the time difference.

Battle Creek & Bay City.—The contract for constructing this road has been let to J. J. Burns. It is projected to extend from Battle Creek to Bay City, Mich.

Birmingham Mineral.—Tracklaying has begun on the seven-mile extension from Birmingham to Gate City, Ala., and it is expected that it will be completed within ten days. The 120,000 oak ties for the Huntsville extension have all been distributed along the line.

Boston & Albany.—The building of a new union passenger station at Springfield, about 1,000 ft. east of the present structure, has been finally decided upon and preliminary work begun, the legal obstacles having been removed and the building of a stone arch bridge (for five tracks) across Main street in place of the present grade crossing having been approved by the County Commissioners. The present station must be discontinued before the change of grade can be effected, and the new station will therefore have to be built and put in use before the bridge can be begun. It is expected that the foundations for the building will be completed the present year.

California Central.—Track laying has been completed north to within eight miles of San Juan and six miles from Oceanside, toward Los Angeles. The bridge over the Los Angeles River has been completed, and work will be pushed to Orange.

Carolina, Cumberland Gap & Chicago.—Nearly all the grading has been completed between Aiken and Edgefield, S. C., a distance of 25 miles. George Potts, Aiken, S. C., is the contractor. An extension of 50 miles will be built this fall to Abbeville. W. H. Schofield, Jr., Aiken, S. C., is General Superintendent.

Central of Georgia.—The company has foreclosed the three mortgages on the Buena Vista & Ellaville which it holds, default having been made on the bonds.

Central Iowa.—Stockholders are notified that the balance of subscriptions remaining unpaid will be due as follows: On the common stock, two per cent. on the 1st days of June, August, October and December, 1888, respectively; three per cent. on the 1st day of February, 1889. On the second preferred stock, two per cent. on the 1st days of June, August and October, 1888, respectively.

Central of New Jersey.—The road has been double tracked between Sewaren, N. J., and Tremley, Pa., two miles, and five miles more will be completed by July 1. P. L. Rehill, Lafayette, N. J., is the contractor for grading. Two miles of second track is being constructed between Long Branch and Galilee, and between Roselle and Jersey City a third track is being constructed. The contract for grading between Centreville and Communipaw has been let to F. C. O'Reilly, of Orange, N. J. Eight miles of side track has been laid on the Lehigh & Susquehanna Division to different manufactories, and 5½ miles of new track between Moosic Junction and Scranton, Pa., has also been laid.

Charleston, Cincinnati & Chicago.—The road has now been completed from Lancaster, S. C., northwesterly to the Catawba River, and work is progressing rapidly to Blacks, S. C., 51 miles further, where it will connect with the Rutherfordton Division of the road. Smith & Ripley, of New York, are the contractors.

Cincinnati, Wabash & Michigan.—The location has been made for the extension from Anderson to Rushville, Ind., 40 miles, and grading on part of the line will be commenced this week.

Cincinnati, Wheeling & New York.—It is expected that the proposed extension from Morgan Junction, Pa., on the Baltimore & Ohio to Freeport, on the Cleveland, Lorain & Wheeling, 22 miles, will be constructed this summer.

Cleveland & Canton.—The work of laying steel rails will begin next week, and it is expected to have the standard gauge tracks ready for use about Aug. 1. The new rails will be laid outside the narrow gauge track, and traffic will not be interfered with. The bridges, roadbed and ties are ready for standard rails.

Cleveland & Mahoning Valley.—At a meeting of the stockholders in Cleveland, May 20, it was voted to authorize the issue of a new consolidated mortgage to the amount of $3,000,000. There will be issued at present only $1,500,000, which will be used in double tracking the road between Cleveland and Youngstown.

Columbus, Hocking Valley & Toledo.—In the suit of John W. Shaw, the President of the road, against Stevenson Burke, the former President, for alleged fraudulent appropriation of $8,000,000 of scurities the Supreme Court of Ohio rendered a decision, May 22, reversing the decision of the Circuit Court, and ordering the case back to the Circuit Court for further hearing. The latter Court, when the case was brought before it on appeal from the Court of Common Pleas by Burke, held that they had no jurisdiction, and from this decision Burke appealed. The Court of Common Pleas heard the case and found for the railroad company.

Corinth & Tennessee River.—The contract for building this road has been let, but nothing has as yet been done in actual construction. The survey has been made from Corinth, Miss., to Pittsburgh Landing, in Hardin County, Tenn.

Cumberland.—An extension is being built from Spring Hill to Oxford, Nova Scotia, a distance of 14 miles. J. W. Chandler, Spring Hill, N. S., is the contractor.

Dallas & New Orleans.—This road, incorporated last winter to build a line from Fort Worth to Dallas, has filed a mortgage in favor of the Mercantile Trust Company of New York, covering $4,500,000 first mortgage six per cent. bonds.

Denver & Rio Grande.—At the special meeting of the stockholders held at Denver, May 22, the agreement with the Chicago, Rock Island & Pacific for the joint use of the track of the company between Pueblo and Denver was ratified. At a subsequent meeting of the stockholders a new improvement mortgage at the rate of $5,000 per mile was authorized, $3,000,000 to be issued immediately, for the purpose of improvements to the company's property.

East Tennessee, Virginia & Georgia.—A third preliminary survey has been made for the extension to Jacksonville, Fla. The line starts from Hazelhurst, Ga., and continues southeast to Jacksonville. The distance is about 120 miles. The data of the Chief Engineer as to the cost of each line has been forwarded to the general office, and when it has been decided which line to construct the contract for grading will be let.

Farmville & Powhatan.—About 25 miles of the extension from Jennings westerly toward Powhatan has been completed and the entire line is expected to be ready for tracklaying by Aug. 1. The surveys to Farmville, 66 miles, have already been completed.

Gardner, Coal City & Northern.—Articles of incorporation have been filed in Illinois for the construction of a road from a point at or near Gardner, in a general northerly direction, through the counties of Grundy, Kendall and Will, to Plainfield, a distance of about 35 miles. The capital stock is $1,000,000 and the principal office is to be in Chicago.

Georgia Southern & Florida.—Tracklaying will be resumed June 1 in Houston County, Ga., and also at Tipton, on the Brunswick & Western, and it is thought that the line will be completed to Valdosta, Ga., by June 1, to which point the road is ready for tracklaying, with the exception of 10 miles.

Grafton & Upton.—Work is progressing on the extension from Grafton Centre, Mass., to West Upton, a distance of about five miles. A. C. Wellington, of North Oxford, is the contractor.

Iowa Central.—Articles of incorporation have been filed in Illinois to purchase and operate the Central Iowa road. The capital stock is $18,400,000.

Jamesville & Washington.—It is expected that construction work will be commenced about Sept. 1 on the extension from Jamesville to Plymouth, N. C., 6½ miles, the survey for which has been completed.

Kansas City & Southern.—It is expected that the tracklaying will be completed from East Lynne to Kansas City, a distance of about 50 miles, by Aug. 1. About 35 miles is now ready for the track.

Kentucky Union.—Contracts will probably be let within sixty days for constructing an extension of the road from Clay City to Jackson County, 59 miles.

Lake Erie & Western.—It is announced that the extension from Bloomington to Peoria will be open for business May 27. Through trains will be run between Peoria, Ill., Indianapolis and Michigan City, Ind., and Sandusky, O. There are seven stations on the new portion of the line, and Peoria is 418 miles from Sandusky, O.

Lehigh Valley.—A line is being constructed from Fairview to Pittston, Pa., 17 miles, and will be used as a cut-off. The contractors are Charles McFadden, Philadelphia; Brodhead & Hickey, Scranton, Pa., and Thomas H. Rickert, Pottsville, Pa. Construction is also progressing on the Roselle & South Plainfield road, for which Charles McFadden is the contractor, and the contract for the Mahoning City Loop, 2½ miles, has been let to Dick & Hughes, Harleton, Pa.

Long Island.—The contract for the four-mile extension from Locust Valley to Oyster Bay has been let to Clark & O'Brien, of New York.

Los Angeles County.—The contract for tracklaying the road from Los Angeles to Santa Monica, Cal., has been let to Spillman Bros., and is to be completed July 1. Work will soon be commenced at Burbank.

Louisville, Evansville & St. Louis.—It is stated that a preliminary survey has been made for a projected extension from Marengo, Ind., northwesterly to French Lick Springs, on the Louisville, New Albany & Chicago, a distance of about 20 miles.

Louisville, St. Louis & Texas.—Nearly all the grading on the road between West Point and Owensboro, Ky., a distance of 90 miles, has been completed. Tracklaying has been commenced at Owensboro, and is progressing at the rate of about a mile a day.

Louisville Southern.—The first freight train left Louisville, Ky., May 16, and consisted of 22 car-loads of grain. The second section consisted of 26 cars. The grain was consigned largely to points in Georgia and Alabama. The United States Express Co. will operate over the road.

Maysville & Big Sandy.—Tracklaying has now been completed from Ashland northwest to Maysville, Ky., and is being rapidly completed to Newport, Ky., opposite Cincinnati.

Meigs Elevated.—The Governor of Massachusetts has signed the bill incorporating the company.

Mexican Central.—The directors have voted to increase the capital stock $2,000,000. About $1,500,000 is to replace stock that had been borrowed and sold for funds applied to the construction of the Guadalajara and Tampico division, leaving about $500,000 in the treasury.

Mexican National.—The road has been completed through El Salado to a point 130 miles beyond Saltillo, and it is expected that the whole line will be finished to San Miguel by Sept. 1, completing the road from Corpus Christi via Laredo, Tex., to the City of Mexico, a distance of 1,001 miles. The distance from Laredo to the City of Mexico is 839 miles.

Monterey & Tampico.—Press dispatches from El Paso state that the Commissioners of the land grant have made a contract with Morris R. Locke & Co., of Jerseyville, Ill., for the building of the road from Monterey to Tampico or Luguna Madore, on the Gulf of Mexico, a distance of 325 miles. In addition to a subsidy of $5,000 per kilometre, the material for construction is admitted free of duty, the property is exempt from taxation for 20 years, and the Mexican Government assumes an indebtedness on the road of $8,000 a mile.

New York, Providence & Boston.—The stockholders of both the New York, Providence & Boston and the Providence & Worcester, at meetings held in Providence, May 17, voted to ratify the lease of the latter road to the former.

Norfolk & Western.—There are now three parties of engineers in the field making the preliminary surveys for the proposed extension from Flat Top Mountain, to Ironton, O., about 200 miles, under Charles S. Churchill, engineer in charge of the extension.

Omaha, Kansas & El Paso.—The company is securing subscriptions in the different counties through which the road will pass, and it is expected that the contracts for the construction of the road will be let about July 1. John D. Elwood, Kensley, Kan., is President.

San Bernardino Central.—The right of way has been secured between Colton and Sunny Slope, Cal., and it is stated that construction work will be commenced in about 30 days.

Seattle, Lake Shore & Eastern.—The contract has been let to Ryan & McDonald, of New York, for grading,

bridging and trestling the road from Raging River on the western side of the Cascade Mountains in Washington Territory easterly about 200 miles to a connection with the branch being built westerly from Spokane Falls, by Burns & Chapman, of Spokane Falls. It is only intended, however, to build across the mountains this year. The contract for constructing the northern branch from Snohomish to Skagit River, about 40 miles, will be let within 30 days.

South Chicago & Blue Island.—Incorporated in Illinois to build a road from Hyde Park to Blue Island, by Joseph R. Putnam, Edward P. Hilliard and others, of Cook County.

Spokane Falls & Northern.—The map of the locating survey has been filed in the Department of the Interior. The line is to extend from Spokane Falls to Little Dalles, on the Columbia River, a distance of about 118 miles.

Troy & Tiptonville.—Tracklaying has been commenced on the first five miles of the road from Troy, Tenn., upon which the grading has been completed. It is being constructed in the interest of the Chesapeake & Ohio.

Vicksburg & North Eastern.—The name of the Vicksburg, Canton & Yazoo City has been changed to the above under the amended charter. J. J. Cowan, Vicksburg, Miss., is President.

Vicksburg & Meridian.—The stockholders' committee have issued a modified plan for the reorganization of the road. The courts have decided that $234,355 floating debt must be paid ahead of any mortgage. The decree for foreclosure sale has been entered for June 6. The plan now proposed provides the needed money, funds the coupons and reduces the debt to $18,500 per mile. There will be issued $1,250,000 35-year bonds, bearing interest at 5 per cent. for five years and 6 per cent. thereafter, to take up the present bonds and interest and provide $33,100 for equipment; $2,650,000 first mortgage consolidated 50-year bonds at 4 per cent. for five years and 5 per cent. thereafter will be issued, $1,250,000 to take up the new firsts when due, the balance to take up $180,000 judgment due, second mortgages $990,000 and $230,000 for betterments and assessments on third mortgage incomes; $1,000,000 income 5 per cent. bonds, a mortgage on the land grant, will be issued to take up $110,000 (10 per cent.) of the present seconds, $242,000 for accrued interest on seconds, $633,000 for 33 per cent. of present third mortgage incomes, and $14,400 for equipment. The present third mortgage incomes will pay 3 per cent. in cash, receive 33 per cent. in new incomes, 42 per cent. common stock and new firsts for the assessment. The new common stock will be limited to $3,000,000, of which income bonds get $807,400; floating debt, $525,320; the present preferred stock 50 per cent. by paying $5 assessment and present common stock by paying $2 assessment. The total charges will be $118,500 annually for five years.

Wilmington Sea Coast.—The tracklaying has now been all completed and it is expected to open the road June 12. The line extends from Wilmington, N. C., a distance of 9½ miles, to the ocean beach in Wilmington. The terminals of the Atlantic Coast Line are used. There is a 5,300-ft. pile bridge over the Sound.

Wisconsin Midland.—The survey for the extension from Fond du Lac to Madison, Wis., has been completed. The line is 70 miles long, and will pass through Waupun, Beaver Dam and Columbus. The maximum grade is 40 ft. to the mile, and no tunnels or large bridges will be required. It is stated that construction will commence about July 1.

Zanesville, Newcomerstown & Cleveland.—The contracts for constructing the road will be let about July 1. It is projected to extend from Zanesville, northwesterly to Mineral City, O., 73¼ miles. The company has made favorable traffic agreements with both the Baltimore & Ohio and the Valley roads. Edmund Turner, Zanesville, O., is General Manager.

TRAFFIC AND EARNINGS.

Anthracite Coal Tonnage.

The statement of the anthracite coal tonnage for the month of April, as compared with the same period last year, is as follows:

	April. 1888.	1887.	Inc. or Dec.	
Phila. & Reading	636 309	604,475	I.	31.834
Central of N. J.	455.248	484.940	D.	29,692
Lehigh Valley	496,533	607.320	D.	110,786
Del., Lack. & West.	438 210	372,007	I.	66,203
Del. & Hud. Canal Co.	296,264	240,407	I.	55,856
Pennsylvania	351,352	294,214	I.	57,138
Pennsylvania Coal Co.	103.055	115,434	D.	12,378
N. Y., L. E. & W.	79,622	68,000	I.	11.621
Total	2,856 593	2,786,797	I.	69,796
From Wyoming Region	1.592.186	1,341,361	I.	160,825
" Lehigh "	465 564	571,674	D.	106,110
" Schuylkill "	888,842	873,761	I.	15,081

	Year. 1888.	1887.	Inc. or Dec.	
Phila. & Reading	1,496,044	2,210,777	D.	714.733
Central of N. J.	1,507,231	1,528,921	D.	21,690
Lehigh Valley	1,577,392	2,116.335	D.	538,943
Del., Lack & West.	2,195,047	1,656,907	I.	538.140
Del. & Hud. Canal Co.	1,478,541	1,232,317	I.	246,223
Pennsylvania	1,320.581	1,057,457	I.	263.124
Pennsylvania Coal Co	464,384	430,462	I.	33,921
N. Y., L. E. & W.	287.114	259,206	I.	27,908
Total	10,326,336	10,492,384	D.	166.048
From Wyoming Region	7,094,290	5,457.574	I.	1,636,716
" Lehigh "	782,162	1,877.330	D.	1,095,167
" Schuylkill "	2,449,883	3,157,480	D.	707,596

This statement includes the entire production of anthracite coal, excepting that consumed by employés, and for steam and heating purposes about the mines, but does not represent the entire anthracite coal tonnage actually transported by the respective railroad companies, adjustment being necessary in the compilation to avoid duplications, etc.

The stock of coal on hand at tide-water shipping points April 30, 1888, was 733,314 tons; on March 31, 1888, 465,709 tons; increase, 267,605 tons.

East-bound Shipments.

The east-bound shipments of flour, grain and provisions for the week ending May 19 amounted to 17,585 tons, an increase of 228 tons compared with the same period last year. The percentages carried by the different lines were as follows: Chicago & Grand Trunk, 9.8; Michigan Central, 17.6; Lake Shore & Michigan Southern, 20.3; Fort Wayne, 21.0; Chicago, St. Louis & Pittsburgh, 10.2; Baltimore & Ohio, 9.9; New York, Chicago & St. Louis, 12.0; Cincinnati, Indianapolis, St. Louis & Chicago, 0.2.

Live Stock Rates.

The cutting of rates on live stock in carloads to Chicago from points on the Missouri River and also from local points west of there has been quite active within the last fortnight, and one road after another has announced that it would take cattle in long cars (which includes the Burton and other special patterns), at the regular tariff rate provided for ordinary stock cars. This virtually makes a reduction of about 10 per cent. A Chicago dispatch of May 22 states that the general managers, at a meeting in that city, had agreed to charge hereafter by actual weight, the change to go into effect June 10.

Minnesota Passenger Rates.

The Northern Pacific has reduced its local passenger fares between all points in the state of Minnesota to 3 cents per mile (from 4 cents). An order was issued last December by the State Railroad Commissioners that this rate be adopted, but the road refused compliance on the ground that it was subject to the control of Congress only. It is now announced that the present reduction is made in consequence of the increase of business and not by reason of any change in the attitude of the road on legal points. The various branches of the Northern Pacific that were built under state charters were ordered a month ago to adopt the 3 cent rate, and it may be that this order has something to do with the present action concerning the main line. The St. Paul, Minneapolis & Manitoba, which received the same order, had appealed to the courts, but, it is said, will now make the reductions in consequence of the action of its competitor, and the appeal will be dropped.

Northwestern Rates.

At a meeting in Chicago, May 17, the general managers of the roads interested agreed to advance through rates between Chicago and St. Paul on June 4, as follows:

	1.	2.	3.	4.	5.
New rates	60	50	35	25	17
Old rates	50	40	30	20	12½
	A.	B.	C.	D.	E
New rates	18	16	14	20	10
Old rates	17½	15	13	11	8

It is stated that the Chicago, Burlington & Northern agreed to these rates, and that all the other roads agreed to join the Burlington in its present low through rate between New York and St. Paul ($1.01 first-class). The raising of the rate from Chicago to St. Paul is done to protect the new advanced local rates to and from Iowa points, and the making of rates through between New York and St. Paul lower than the combined Trunk line and Northwestern rates seems to have been fully decided upon.

Traffic Notes.

The "Interstate Dispatch" Fast Freight Line has been formed to do business over the following roads: Fitchburg, Delaware & Hudson Canal Co., New York, Lake Erie & Western, New York, Chicago & St. Louis, Wheeling & Lake Erie, Lake Erie & Western, Cincinnati, Hamilton & Dayton, Grand Rapids & Indiana, Indiana, Illinois & Iowa and Chicago & Alton.

It has been agreed that the Michigan Central and New York, Lake Erie & Western roads may take dressed meats from Hammond to New York at 55 cents, which is 10 cents under the regular rate.

The Lake Shore & Michigan Southern and the Pennsylvania companies have agreed to make the sleeping car fare on their limited trains from Chicago to New York $8 instead of $7 as at present. This makes the west-bound and the east-bound rates alike.

Coal.

The coal tonnages for the week ending May 19 are reported as follows:

	1888.	1887.	Inc. or Dec.	P. c.
Anthracite	609.851	626.263	D. 14,412	2.5
Bituminous	310,123	254,089	I. 56,034	22.1

The Cumberland coal trade for the week ending May 19 amounted to 68,149 tons, and for the year to that date, 1,294,776 tons.

Railroad Earnings.

The statement of the Pennsylvania Railroad of earnings on all lines east of Pittsburgh and Erie for April, 1888, as compared with same month in 1887, shows an increase in the gross earnings of $307,211; an increase in expenses of $105,475; an increase in net earnings of $201,736. The four months of 1888, as compared with the same period of 1887, show an increase in gross earnings of $1,156,214; an increase in expenses of $1,130,111; an increase in net earnings of $26,103. All lines west of Pittsburgh and Erie for the four months of 1888 show a deficiency in meeting all liabilities of $103,613, being a loss, as compared with the same period of 1887, of $457,843.

Earnings of railroad lines for various periods are reported as follows:

	1888.	1887.	Inc. or Dec.	P. c.
Month of April:				
Cape F. & Y. Vy.	$22,104	$18,929	I. $3,175	16.6
Net	8 879	8,192	I. 687	8.4
Nash., C. & St. L.	232,263	222,720	I. 9,543	4.0
Net	87,988	92,585	D. 4,597	4.3
Rich. & W. P. Ter.				
Rich. & Danv.	349.583	314.964	I. 34,619	10 8
Net	139.348	178,094	D. 11.254	8.6
Va. Mid. Div.	144,983	121.438	I. 23.545	19.0
Net	61,113	49,016	I. 12.097	24.5
Char., C. & A.	57,470	54,089	I. 3,381	5.5
Net	13,654	16,949	D. 3.295	18 8
Col. & Gr. Div.	35,884	30,649	I. 5,245	16.6
Net	4,116	Def. 9,317	D. 5,201	55.5
W. N. Car. Div.	46.961	56,807	D. 9,846	16.1
Net	8,401	9,458	D. 1,057	11.1
Staten Is. R. T.	53,994	52,450	I. 1,544	1.9
Net	8,842	5,041	I. 3,201	60.0
Month of March:				
Grand Tr. of C.	284,151	338,265	D. 54,114	15.9
Net	71,282	109,475	D. 38,193	34.9
Chic. & Gr. Tr.	56.977	67,553	D. 10,576	15.0
Net	14,468	20,939	D. 6,471	30 9
D., G. H. & Mil.	17,065	22,446	D. 5,381	22.7
Net	3,164	4,874	D. 1,710	25.0
Mexican Central.	550,286	399,974	I. 150,312	37.6
Net	225,008	185,010	I. 39,998	21.1
Mex. National	209,667	160,163	I. 49,504	30.7
Net	Def. 25,905	39,180	D. 13.275	33.3
Ore. Imp. Co. Net	66,652	73,707	D. 7,055	9.5
Rome, W. & Og.	251,661	254,121	D. 2,460	0.8
Net	104,733	103,349	I. 1,384	0.9
Southern Pacific:				
Pacific System.	2,827,054	2,270,408	I. 556 646	24.5
Net	1,010 017	953.659	I. 56,358	5.8
Three months—Jan. 1 to March 31:				
Gr. Trunk of C.	778.422	865,374	D. 86,952	9.9
Net	151,986	215.608	D. 64,622	29 5
Chic. & Gr. T.	158,466	162,601	D. 4.135	2.4
Net	35,449	38,136	D. 2,687	5.3
D., G. H. & Mil.	48,838	56,080	D. 7,242	12.5
Net	6,815	8,753	D. 1,938	12.5
Mex. Central	1,544,492	1,208,557	I. 335,935	27.7
Net	721,623	587,560	I. 134.060	22.8
Mexican Nat.	576,521	437,759	I. 138,762	31.6
Net	46,445	74,321	D. 27,876	36.5
N. Y. C. & H. R.	8,152,796	8,089,351	I. 63,445	0.8
Net	2,350,768	2,580,456	D. 229,688	8.8
Oregon Imp. Co.				
Net	171,338	134,624	I. 36,714	2.6
Rome, W. & O.	688,106	640,337	I. 47,829	7.3
Net	247,909	237,618	I. 10,291	4.2
Southern Pac. Co.:				
Pacific Sys.	7,700,927	5,602,092	I. 2,098,835	37.4
Net	2,589,915	2,101,131	I. 488,784	23.2
Four months—Jan. 1 to April 30:				
Cape F. & Y. Vy.	105,034	86,617	I. 18.417	20.9
Net	51,643	42,054	I. 9,579	21.4
Nash., C. & St. L.	1,009.037	960.008	I. 49,029	5.1
Net	406,162	408,083	D. 1,921	0.3
Rich. & W. P. Ter.				
Rich. & Danv.	1,601,063	1,383.842	I. 217.221	15.7
Net	774.568	685,004	I. 89.504	13.0
Virginia Midl.	534.532	470,203	I. 64,329	13.9
Net	203,642	167 947	I. 35,695	21.0
Char., Col. & A.	317,088	278.640	I. 38,428	13.6
Net	140,548	135,473	I. 5,075	3.7
Col. & Gr. Div.	221,537	192.053	I. 29,484	15.1
Net	92.395	61,002	I. 31,393	50.8
W. N. Car. Div.	207,379	211,776	D. 4,397	1 9
Net	30,621	42,439	D. 11,818	26.1
St. I. Rap. Tran.	181,332	178,015	I. 3,317	1.8
Net	5,133	Def. 2,721	I. 2,612	100.0
Four months—Jan. 1 to April 30:				
Atlantic & Pac.	863,427	912,650	D. 49.223	5.3
Buff., R. & Pitts.	589,185	600,551	D. 11,366	1.8
Bur., C. R. & Nor.	832,032	938,237	D. 106,205	11.3
Cairo, V. & Chic.	220,928	222.052	D. 1,824	0.4
California South.	620,523	516,542	I. 103,981	20 0
Canadian Pac.	3,635.722	2,724,793	I. 911.929	33.9
Cape F. & Y. V.	105,140	86 917	I. 18,503	20.9
Central of Iowa.	432,366	429.904	I. 2,462	0.4
Ches., O. & S. W.	615,729	549 969	I. 65,760	11.8
Chic. & Atlantic.	670,650	693,456	D. 22,806	3.1
Chi. & East. Ill.	632,137	619,956	I. 12,181	1.9
Chi. & Ind. Coal.	167,600	120,468	I. 47,132	39 1
Chi., Mil. & St. P.	6,785,000	7,207,559	D. 422,559	5.8
Chic. & Ohio R.	14,504	22,109	D. 7,605	31.9
Chi. & W. M.	422,210	426,124	D. 3,914	0.7
Cin., J. & Mack.	144,884	128,301	I. 16,583	12.5
Cin., N. O. & T. P.	1,120,168	1,036 823	I. 83,345	8.0
Ala. Gt. South.	509,186	482,463	I. 26,722	5.4
N. Ori. & N. E.	284,861	223,912	I. 60,949	26.7
Vicks. & Mer.	162,262	172,469	D. 10,207	5.8
V., Shre. & P.	171,409	174,736	D. 3,327	1.7
Cin., R. & Ft. W.	132,504	127,773	I. 4,731	3.1
Cin. & Spring'd.	358,581	344,488	I. 14.093	4.1
Cin., W. & Balt.	683,477	679,900	D. 16,423	2.3
Cleve., Ak. & Col.	186,908	169,895	I. 17,013	10.1
Cl., C., C. & I.	1,265 432	1,303,820	D. 38,388	2.9
*Col. & Cin. Mid.	86 338	91,384	D. 5,046	5.5
Col., H. V. & T.	788,379	895,840	D. 107,421	11.9
Den. & R. G.	2,206 684	2,267,055	D. 60,371	2.6
Den. & R. G. W.	380,537	302,441	I. 78,096	25.8
Det., B. C. & Al.	139,288	123,235	I. 12,053	13.0
Det., Lan. & No.	292,884	341,815	D. 48,931	14.1
Du., S. S. & At.	301,956	211,497	I. 90,459	42.6
E. Ten., Va. & G.	1,785.516	1,595,918	I. 189,598	11.9
Ev. & Indianap.	69,560	72,411	D. 2,851	2.7
Ev. & Terre H.	264.119	251,239	I. 12,880	4.7
Flint & P. M.	818.989	812,499	I. 6,490	0.7
Fla. Ry. & N. Co.	367,504	365,936	I. 1,568	0 3
*Ft. W. & Den. C.	249 679	180,895	I. 68,784	37.7
Georgia Pacific.	406,340	346 460	I. 59,870	17.1
Gr. Rapids & Ind.	690,027	684,753	D. 4,726	0 6
Other lines	63,647	42,737	I. 20,910	47.6
†Grand Tr. of Can	5,067,483	5,619,100	D. 551,617	9.8
Houston & T. C.	680,323	728,531	D. 48,208	6.6
Hum. & Shen.	45,661	47,131	D. 1,470	2.1
Ill C. (I. & S. Div.)	3,571,382	3,544,112	I. 27,270	0.7
Cedar F. & M.	25,732	36.031	D. 10,299	27.7
Dub. & Sioux C.	271,467	246,478	I. 24 989	9.1
I. F. & S. City.	243,142	196,688	I. 46,454	23.5
Kanawha & Ohio.	81,352	38,553	I. 42,799	110.6
*K. C., Ft. S. & G.	735,196	802,805	D. 67,609	8.3
*K. C., Sp. & Mem.	501,960	598,068	D. 96,099	16.1
*K. C., Cl. & Spr.	74,966	79,679	D. 4,713	5.1
Kentucky Cent.	289.124	286,049	I. 3.075	1.1
Keok. & West	102,131	98,875	I. 3,256	3.1
Kingston & Pem.	51,331	38,511	I. 12,820	31.6
Lake E. & W.	593,364	619,961	D. 26,597	4.2
Lehigh & H. R.	67,650	81 987	D. 14,337	17.2
*L. Rk. & M.	236 825	258,319	D. 21 494	8 2
Long Island	769.942	740.649	I. 29,293	3 9
Lou., Ev. & St. L.	295,850	269 401	D. 3,551	1.0
Louisv. & Nashv.	5,014.854	4,904.580	I. 110,274	2.2
Louis., N. A. & C.	614 946	640,102	D. 25.156	3.9
Lou., N. O. & Tex	801,833	681,343	I. 120,490	17.6
Memphis & Chas.	547.619	526.730	I. 20,889	3.8
‡Mexican Central	2,002,292	1,572,665	I. 429,627	27 3
‡Mexican Rail.	1,252,939	1,163.180	I. 89,759	7.6
Mil., L. S. & W.	634,453	790.824	D. 156,371	19.8
Mil. & Northern.	309,852	294,712	I. 15.140	5.1
Minn. & St. L.	414,645	516,349	D. 101,704	19.5
Mobile & Ohio.	785,422	780,386	I. 5,036	0.6
Nat., Jack. & Col.	51,589	52,865	D. 1,276	1.5
N. Y. C. & H. R.	10,901,573	10,991,091	D. 89,518	0 8
N. Y., O. & West.	462,203	404,807	I. 57,396	14.6
Norfolk & West.	1,520,947	1,199 941	I. 321,006	26.8
Northern Pacific.	4,259,568	3,248,834	I. 1,010,734	31.1
Ohio & Miss.	1,158,946	1,297,238	D. 138,292	10.6
Ohio River.	111,120	72,579	I. 38 541	52.7
Ohio Southern.	198,100	195,950	I. 2,150	1.0
Pitts. & West.	532,742	615,883	D. 83,141	13.5
Rich. & Danville.	1,588,280	1,382,707	I. 205.573	14.9
Va. Mid. Div.	515,274	462,765	I. 52,509	11.2
Char., C. & A.	319,418	278,660	I. 40,758	26.2
Col. & Gr. Div.	221,603	192 053	I. 29,550	15 1
West. N. C. Div.	223.065	211.776	I. 11,289	5.2
W. O. & W. Div.	32,250	28.937	I. 3,313	10.6
Ashev. & S. Div.	34,074	13,756	I. 20,318	153.9
§St. L., A. & T. H.	631,005	649.183	D. 18,178	2.8
Branches	291,240	293,759	D. 2,519	0.9
St. L., A. & Tex.	810,748	653.315	I. 157,433	24.1
St. L. & San F.	1,649 196	1,768,060	D. 118 864	6.6
St. P. & Duluth.	341,775	363 549	D. 21,774	5.6
St. P. M. & Man.	2,584,524	2,260,521	I. 324.003	14.3
Sau A. & Aran. P.	274,561	107,665	I. 166,896	155.1
Shenandoah Val.	244.562	250,789	D. 6,227	2.4
Stat. Isl. Rap. T.	181,338	178.015	I. 3.323	1.7
Texas & Pacific.	1,964.304	1,883,760	I. 80,544	4.2
Tol., A. A. & N. M.	189,905	159.093	I. 30,812	18.8
Tol. & Ohio Cent.	374,882	315,789	I. 59,093	18.7
Tol., P. & West.	274,827	284,536	D. 9,709	3.1
Valley (Ohio).	201.373	198,083	I. 3,290	1.5
Wabash West.	1,633 105	1,904.532	D. 271,427	14.2
West. N. Y. & P.	876,306	822.778	I. 53 528	6.4
Wheeling & L. E.	289.978	233,788	I. 56.190	24.0
Wisconsin Cent.	1,079.076	1,042,264	I. 36,812	3.4
Total	$92,624,743	$89,762,462	I. $2,862,281	3.1

* Includes three weeks only of April in each year.
‡ Mex can currency. To April 28.
§ Including Indianapolis & St. Louis.

Early reports of monthly earnings are usually estimated in part, and are subject to correction by later statements.

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